

CHAPTER

8

Argument

I told there was a society of men among us, bred up from their youth in the art of proving by words multiplied for the purpose, that white is black, and black is white, according as they are paid. To this society all the rest of the people are slaves."

—Jonathan Swift

Argument is writing that persuades readers to accept an idea or adopt a course of action. Certain language characteristics distinguish arguments as a distinct genre.

DEFINITION

An argument is a kind of intellectual conflict where people disagree about what's true or right. The euthanasia or abortion debates, for instance, split into polarized camps, each believing earnestly in its own viewpoint.

The goal of argument is to win popular support, so argument is inherently a public discussion.

REASONING, EXAMPLES, LOGIC

Although an argument begins in disagreement, it does more than simply refute opponents. A superior argument supports its main idea with evidence and sound reasoning, working together harmoniously to establish the thesis. In fact, the evidence should dominate and form the bulk of any argumentative paper.

An argument = position + soundly reasoned evidence.

OBJECTIVE EVIDENCE

Because argument is a social process, it must offer evidence that meets a public standard. The most compelling proof in this regard is **physical proof seen and shared by all**. Consider the case for Bigfoot. Many people report seeing it, but the debate won't be resolved until someone produces an actual Sasquatch body. The state motto of Missouri provides a helpful guide for argumentative proof: *show me*.

Some topics are hard to argue because of their intangible nature. Discussions of the afterlife, God, the spirit realm, Feng Shui, heaven, conspiracy theories, and recovered memory, lack objective evidence, and perhaps can't be argued at all. Because of their nebulous character, these claims are difficult to disprove, so people wrongly accept them as valid.

Key point: subjective claims must be argued in objective terms.

MEASUREMENT

Measurement improves on the idea of objective proof, for evidence that can be quantified tends to be more accurate, consistent, and compelling.

Consider global warming. We find much evidence for this theory in our daily lives: hot summers, warm winters, forest fires, melting glaciers, dropping water tables. These are important clues, but unless measured against an external scale, they remain subjective and anecdotal.

When we measure climate change, a pattern emerges confirming the model. Meteorologists look at temperature readings and determine whether this summer is hotter than last; they establish a pattern over time, and calculate the rate of temperature acceleration; measurement differentiates between an anomaly and a general trend.

TESTABILITY

A good argument can be tested, and so verified or rejected. ESP makes a valid argumentative subject because researchers can devise experiments that test psychic abilities. Such trials push the debate beyond the researcher's personal beliefs, and let the experimental results indicate whether ESP exists. Testability even adds weight to arguments that are moral, ethical, or philosophical in nature.

For a test to work, it must provide a chance for either failure or success. For an argument to work, an idea must, paradoxically, permit the possibility that it's wrong.

If an idea can't be tested, it may be a belief that lies outside of the argumentative realm. Christians, for example, haven't devised a satisfying experiment to test whether God exists, because belief in God is an article of faith that can't be doubted. Arguments can be shown to be wrong, but a belief remains a belief, no matter how much evidence amounts against it.

REFUTATION (反駁, 反証)

Contradiction is a feature of the argumentative genre. If all facts align on one side, no one would argue over them.

A good argument never ignores contradictory information, but recognizes and confronts it, making concessions and rebuttals. A good writer looks at all known facts—even incongruous ones—and blends them into a balanced verdict. → 불합치하는 사실 조화

UNIFIED PROPOSITION

Could you imagine a judge who fails to decide whether the accused is innocent or guilty? Such a judge is incompetent and irresponsible.

Writers of argument have a similar responsibility to advance a single plan. In the capital punishment debate, it's pointless to say both sides have good points. Eventually, the author must choose whether or not to condone executions.

Key point: don't sit on the fence. Choose a position—even a moderate one—and argue it.

CONSEQUENCES AND SOCIAL CHANGE

Medieval theologians never actually debated how many angels could dance on a pinhead, but they did quarrel over inconsequential stuff. Do saints go the bathroom in heaven? Did Eve have a belly button? Will Adam ever get his rib back? These aren't creditable arguments because they're inconsequential, even for Christians.

By nature, arguments treat significant subjects that affect large segments of population, seeking to change belief or behaviour.

Key point: arguments discuss important ideas and seek change.

LIFESPAN

If argument is a public separation of truth from falsehood, then some propositions eventually fail, while others succeed. Debate eventually leads to consensus, and arguments that once split a community are laid to rest. No one seriously quarrels anymore over witches, meteors, or slavery, even though these were once subjects of furious, even murderous debate. Arguments have a lifespan and die.

THE QUALITY OF PROOF

"A proof is a proof. What kind of a proof? It's a proof. And when you have a good proof, it's because it's proven."

—Jean Chrétien

All arguments offer some proof. For example, the Flat Earth Society offers evidence verifying the earth as a two-dimensional surface. Victorian doctors provided research proving women intellectually inferior. Pharmacists declared Thalidomide safe for pregnant mothers. As such invalid claims show, proof isn't always enough for establishing truth.

If argument is a competition where ideas vie for acceptance, then the big question isn't which arguments have reasons and evidence. They all do. The question is *which argument has the superior proof?* Or better, *which theory best fits all known data?*

Consider why we believe that earth revolves around the sun, and not the other way around. Common sense favours a geocentric model (the earth-centred one), as the evidence of our senses suggests our planet stays still, while the sun, moon and stars reel through the heavens. The Alexandrine mathematician Claudius Ptolemy devised a geocentric model that explained the movement of the five known planets, stars, and moon. Ptolemy's system was a complicated matter, as the apparent retrograde motion of the planets (their tendency to apparently reverse motion) forced him to add epicycles or loops onto the perfectly circular orbits of his model. Despite these complications, Ptolemy's system predicted celestial movements and events with accuracy, higher even than the heliocentric model of Nicholas Copernicus. This is a historic shocker for many people: Ptolemy's earth-centred system works better than Copernicus' sun-centred one.

So why do we reject the evidence of our eyes, and believe that the earth rotates around the sun?

Of course, the West didn't opt for the "correct" answer right away. The Church considered geocentrism part of its doctrine, bulled Copernicus to abandon his theory, imprisoned Galileo for teaching it, and even burned Giordano Bruno. Heliocentrism had to battle religious dogma before it could be accepted.

And to top it off, all things weren't equal—Ptolemy's system worked better than his rival's. Galileo and Bruno backed a less predictive theory, at least initially.

The debate took time to resolve. When the astronomer Johannes Kepler replaced Copernicus' circular orbits with ellipses, the accuracy of the heliocentric model improved beyond Ptolemy's. With the invention of telescopes, new evidence accumulated in favour of the

sun-centred model, until belief in Ptolemy's model became untenable. Space travel introduced visual confirmation of earth's planetary motion. The heliocentric system gradually won because it explains *all* of the emerging data in a more comprehensive way.

The question is partially one of depth. Flat Earthers adequately explain the experience of the average pedestrian unconcerned by a few misbehaving lights in the sky. Ptolemy adequately explains the movements of the planets seen with the naked eye. The Copernicus-Kepler hypothesis accounts for all the planetary motion seen through telescopes, as well as spacecraft. With each step, the scale of evidence broadens. The earlier theories made sense only if they ignored new evidence.

The transition from a geocentric to a heliocentric model says much about argument and the establishment of a truthful proposition.

- ✓ All arguments have evidence. Yet, this doesn't make them valid.
- Arguments are approximations, rather than eternal "truth."
- The argument that best explains all data wins the day.
- Beliefs change in response to new discoveries and information.
- Some arguments require centuries to resolve.
- Worldviews have shifted, and will shift again.
- Truth is often influenced by other values.

These lessons help us judge debates currently raging today, such as the controversies over global warming, Intelligent Design, and UFOs. These propositions offer a hefty body of "proof" and argue for a radical swing in belief systems (in Thomas Kuhn's useful phrase, a "paradigm shift").

Because proof itself is insufficient for establishing the truth of a claim, we must judge these cases in competition, and choose which one best fits all the available data—a task that requires research. And we need to keep an eye open for the places where evidence is ignored or suppressed. What biases do the proponents hold that might make them blind?

In this spirit, let's consider that perennial topic of forbidden science: UFOs. Conservative by nature, scientists tend to dismiss UFO encounters as nonsense, and so ignore difficult-to-explain data: landing impressions, burn marks, radiation trails, radar logs, and eyewitness testimony. Scientists scoff that UFOs lack evidence, but there exist realms. By discounting the data, by discrediting witnesses as fantasy-prone, scientists behave in a most unscientific manner.

On the other hand, the UFO case is far from solid. Although some data demands scientific investigation, other evidence is questionable. Mistakes and hoaxes abound. The use of hypnotic regression compromises testimony. Money-hungry movie executives fill

the popular consciousness with tales of aliens. The UFO field has so much interference that the "truth" is never a simple matter.

LOGIC AND LOGICAL FALLACIES

"Logic is the anatomy of thought."

Logic is a system that builds truthful arguments and identifies fallacies. While hardly perfect, logic remains a helpful guide, especially for developing persuasive points and detecting flawed reasoning. Philosophers classify logic into two categories: inductive and deductive reasoning.

INDUCTIVE REASONING

Inductive reasoning (IR) refers to the process of reaching conclusions based on observations of the physical world. A doctor uses IR when observing symptoms and making a diagnosis.

Patient: I have fever, aching muscles, sore throat, congestion and a cough.

Doctor: You have the flu.

The particular symptoms indicate a general category of disease, the flu. IR is the process behind the scientific method itself; it begins with the collection of data and ends with an explanation. In other words, IR moves from the specific to the general. We frequently rely on IR to make decisions, for IR is the vehicle of experience.

Mandeep bought five computers from Dell, and they all crashed. Dell makes lousy computers.

IR is a powerful form of reasoning, for its conclusions are based on observable patterns in the real world.

The trouble with IR is that the movement from a particular observation to a general conclusion is always a leap. It takes a limited experience and passes it off as a definite truth. This built-in tendency towards overstatement can produce some dodgy ideas.

A **hasty generalization** is the name given to a logical error that occurs when a conclusion is based upon insufficient evidence.

My car won't start. It must need gas.

This reasoning uses limited observation to reach an unwarranted conclusion, for many other factors may explain the car's

There's a dead battery, missing spark plugs, extreme cold. Upon reflection, we see that the doctor's diagnosis from our first visit is also a hasty generalization, as other illnesses such as pneumonia or bronchitis produce identical symptoms. So too is the claim regarding Dell computers based on anecdotal evidence. It may be due to Mandeep's negligence not Dell's design. In each case, we lack enough evidence for absolute or even convincing conclusions.

Many generalizations decrease in proportion to the amount of data we have. The bigger the sampling, the more reliable are the conclusions. One large caution: conclusions are only as good as the evidence.

DEDUCTIVE REASONING

Deductive reasoning (DR) describes a process of applying known facts to real situations and reaching new conclusions. Logicians call the known truth a "premise," and they distinguish between a major premise (a general principle) and a minor premise (an observation). When a major and minor premises join together, we reach a new conclusion.

All humans are mortal.

Jerome is human.

Therefore Jerome is mortal.

This three-line progression is called a syllogism, and provides

a foolproof block of DR.

In contrast to IR, DR moves from the general to the specific.

The major problem with DR rests in the ideas it assumes as true.

When left reasons from a mistaken assumption, it produces flawed results.

Freston is a lean and hungry man.

Such men are dangerous.

Freston is a dangerous man.

This sounds reasonable, except for that second line slipping by like a wolf in sheep's clothing. The premise that lean and hungry men are dangerous is dubious, and so are the conclusions drawn from it. Here's an example that drives the point home.

All English teachers are charismatic and sexy.

David Lewis is an English teacher.

He must be charismatic and sexy.

The fault here, obviously, lies in the major premise.

False premise is the name given this error. An argument begins with a doubtful statement produces tainted results.

Genetic fallacy is a particular kind of False Premise that begins with bigoted ideas about an entire race of people. Sometimes called the **Naturalistic Fallacy**, this error contends all people within a genetic or biological block share similar features.

All Caucasians lack rhythm.

Geddy is Caucasian.

Therefore Geddy has no rhythm.

People of one race don't possess the same abilities, talents, passions, predilections, and beliefs. Genetic fallacies sound logical but rest on prejudice.

The genetic fallacy also applies to assumptions that homogenize any large group.

All lawyers are crooked.

Homosexual men lead promiscuous lives.

These premises make generalizations that appeal more to stereotypes than reality. Whether positive or negative, such ideas wrongly characterize people who share the same profession, gender, class, or religion, and lead to mistakes.

The main flaw in DR is that its conclusions are only as good as its presumptions. Flawed ideas = flawed conclusions.

A **logical fallacy** is an argument that's formally sound, yet leads to incorrect deductions (fallacy is a \$10-word meaning bad reasoning). We've already looked at two fallacies in the false premise and the hasty generalization, but philosophers have identified many more.

An **analogical fallacy** occurs when a writer compares two objects, and allows their similarity to pass as equality. For example, people often discredit an idea by comparing it to Nazism.

Just as the Nazi party blamed the Jews for German ills, an anti-has the anti-free trade movement found a convenient scapegoat: the CEOs.

The analogy has a grain of truth: both groups direct frustration against a minority in society. The writer here obviously wants people to see protestors as vindictive and irrational as the Nazis, and in a small way, this rings true.

However, this analogy misleads when we try to see the two terms as synonymous, and forget their overwhelming differences. The Nazis were racist, but the protestors aren't; the Nazis seized power through violence, but protestors are mostly peaceful; the

have commanded a military force, but protestors have none; have committed genocide, while protestors promote justice. In the differences here are so profound, they overpower the similarity and render the analogy an insult.

Examples can be effective but must be used carefully and evaluated judiciously.

The appeal to good character (*argumentum pro hominem*) asserts a proposition is true because it comes from a well-regarded person or source. Translated into a syllogism, the fallacy appears

The speaker is respected.

The speaker said X.

X must be true.

Obviously a good reputation doesn't guarantee a belief is true, yet the appeal to good character abounds.

One of the greatest intellectuals of the age, Noam Chomsky, says the Western news media is a propaganda machine.

The problem is that we accept a proposition based on the speaker's good character, rather than on the idea's merits. Chomsky is respected, but like any human being, he's prone to mistakes, foibles, and emotions. The quality of the speaker doesn't guarantee the validity of the statement, no matter how "authoritative" the voice.

Industry endorsements use pro hominem strategies to sell consumer wares, hoping that the charm, athletic prowess, or sex appeal of an star transfers to the product. Such character-based marketing breaks our trust and says nothing about the merchandise.

Appeal to bad character (*argumentum ad hominem*) suggests a proposition is false based on the bad reputation of its speaker. This fallacy pressures us to reject an idea because it originates from a disreputable or unpopular source. As a syllogism, it looks like this:

The speaker has a dubious character.

The speaker said X.

X must be false.

Typically an ad hominem argument is subtler:

Barbara Amiel wants to privatize medicine in Canada, just the sort of idea one expects from a billionaire's wife.

This statement coerces us to reject an idea based on a bad reputation of the speaker. It bullies us into resisting privatized medicine because Barbara Amiel married rich. Private medicine may or

may not be good for Canada, but this reasoning decides the issue on irrelevant grounds. Character isn't a reliable guide to truth.

Sadly, ad hominem arguments are a mainstay of political campaigning, as rivals sling muck and impugn moral character instead of examining policies and ideas.

Based on the Latin word *antiquatum* meaning "the past," **appeal to tradition** (*argumentum ad antiquatum*) suggests an idea is right because it's old. Filled with error, intolerance, and stupidity, tradition regrettably offers an unreliable guide to truth and moral behaviour.

Throughout history, marriage has been a union between men and women. If we sanction gay weddings, we'll undermine a time-honoured institution.

The argument here is pure ad antiquatum: the past definition of marriage forms the future one. Yet, by this reasoning, we should revive the "time-honoured institutions" of slavery, fascism, and witch burning, for these all have past precedent. History doesn't guarantee the rightness of any proposition.

The **appeal to popularity** (*argumentum ad populum*) fallacy persuades us an idea is valid because many folk believe it (*populum* is Latin for "people"). The strength of this pseudo-reasoning rests in the large numbers of adherents, not objective standards.

Everybody knows a private business provides services more efficiently than government.

The key words are "everybody knows," the essence of appeal to popularity. They coerce us to trust a scheme, merely because it's fashionable. Of course, an idea isn't necessarily true or justified because a crowd says so.

Based on the dubious authority, ad populum is the herd mentality masquerading as reliable reasoning. It's mob-think.

Circular reasoning (*circulus in probando*) occurs when the conclusion appears as part of an argument's proof.

The Bible is the word of God.

The Bible says that God exists.

Therefore God exists.

The problem here is that the existence of God has been settled using the word of God, the Bible. God thus vouchsafes for itself the logical equivalent of a dog chasing its own tail.

Also called **begging the question**, circular reasoning is easy to spot, particularly when the conclusion echoes the same words as the premise: "A pollutant is a polluting agent emitted by a pollutant."

Sound reasoning is harder to spot when the repeated idea hides behind a set of synonyms.

As magazines displaying lascivious and licentious images are pornographic.

You know a treasonous idea by the way it betrays Canadian values.

These seem to say something, but merely regurgitate the conclusion in the proof, and so add no new information.

A false dilemma or **bifurcation** presents only two sides in a debate, even though many other perspectives exist. A fancy word for "either/or" to split into two," bifurcation polarizes discussion into two positions and forces us to choose between an artificially good idea and a convinced bad one.

We stand at a crossroads: we can master the genetic code or embrace ignorance.

Sometimes called **black and white thinking**, bifurcation omits middle paths, moderate answers, and alternatives to "yea" or "nay." Inspired by a sense of crisis, the false dilemma forces us to choose in a rigged contest.

The **appeal to force** (*argumentum ad baculum*) sways people by making a direct or veiled threat. A Latin phrase meaning "arguing with a stick," argumentum ad baculum intimidates with fear of physical, psychological, economic, or other injury.

If you reject Christ, you're going to hell.

Fanaticism forces families must vacate their homes willingly or face a military solution.

These arguments ignore the merits and detriments of the issues at hand, resolving controversies by menacing opponents with a fist, rather than debate. The appeal to force is the strategy of a bully.

The **appeal to pity** (*argumentum ad misericordiam*) influences us by demanding sympathy. Based on the Latin word for "pity," this fallacy focuses attention on the suffering created by a course of action.

I got the wrong answer, but I'm already on Academic probation; if you fail me on this quiz, then I'll be kicked out of college, lose my scholarship, and my residence. Can't you give me a D--?

This student appeals a failure by demonstrating the havoc the mark wreaks on his life. By focusing on his pain, the student delivers an emotional punch that's difficult for a caring person to ignore.

However, his argument skirts the issue of fairness and sound ability. He admits his answers were incorrect, yet still wants credit for them. He botches his schoolwork consistently, yet feels poor conduct merits reward. The student amplifies his suffering hoping a professor will pay attention to it, rather than his own irresponsibility.

This appeal to pity exploits human kindness, but never asks whether suffering is appropriate.

A **straw person argument** sets up a deliberately weak opposition, just to knock it down. Also known as **poisoning the well**, this fallacy is “straw” in the sense that it attacks a shell of the opposition’s real argument, an effigy that can be easily quashed, hoping to discredit the whole case.

Homeless kids choose a life on the streets so they can enjoy the freedom, drugs, and partying. Don’t feel sorry for them.

Certainly this accusation fits a portion of the street-kid population, but an extremely small, even negligible percentage. Most children flee homes to escape sexual abuse, violence, poverty, or abandonment. While the street life has moments of pleasure, these are grossly offset by problems and perils: hunger, malnutrition, disease, late winters, theft, rape, assault, pimps, and prostitution. By focusing attention on a few “homeless tourists,” the argument reduces a complex pathway for street kids, while neglecting the major reasons for their flight.

The fallacy of the **false cause** (*post hoc, ergo propter hoc*) occurs when we wrongly assume that one thing has caused another. Latin for “after this, therefore because of this,” *post hoc, ergo propter hoc* usually revolves around two events happening near each other. If A and B occur closely together in time, this fallacy takes for granted that A causes B.

Shortly after angora sweaters became fashionable, teenagers began bearing children out of wedlock. Angora sweaters can tribute to teenage pregnancy.

Every night the cicadas start singing, and then the sun sets. Cicadas make the sun go down.

Ever since Tanner began listening to Rap music, he’s been slacking off in school and talking back to his parents. Those CDs are ruining his life.

In the first case, the correlation between sweaters and pregnancy is merely coincidental. In the second case, the observer has confused cause with effect. In the third case, the two effects share a high correlation, but have been caused by an unstated factor.

anyone suggest). In all of these situations, two unconnected events are wrongly linked.

A **slippery slope argument** discredits an idea by connecting it to dire and unrelated consequences. The fallacy suggests that if we agree to pass, then so will B, C, D, and E, all falling together like a stack of dominoes. The imagery implies we stand at the edge of a cliff beyond which we mustn’t advance, else we slide down a fatal slope.

If we sanction same-sex unions today, then tomorrow we’ll have to recognize polygamy, incestuous relationships, adult/child sex, even bestiality.

In this example, the speaker rejects gay marriage based upon a version to polygamy, incest, pedophilia, and eventually animal sex. Although these are all alternate sexualities, they differ greatly, marking separate issues. We can condone the first without accepting the last.

EMOTIONAL APPEALS

And reason has no power against feeling.”

—Charlotte Perkins Gilman

Sigmund Freud argued that humans are irrational, driven by subconscious desires and fear more than reason. If Freud’s right, a writer should consider emotion as much as logic, for tweaking the right feelings can be more persuasive than the facts. Rhetoricians often make a distinction between argument (that appeals to reason) and persuasion (that appeals to emotion). If argument strives to establish valid or ideal propositions, persuasion aims for a simpler goal: to sway as many people as possible. Hitler suggested that politics is the science of tapping the masses, a maxim that nicely defines persuasion.

Advertising is a familiar form of persuasion that routinely exploits our passions, insecurities and fantasies. Car commercials appeal to psychological factors such as power, prestige, or freedom, rather than tangible qualities like fuel economy or reliability. Today, it’s a challenge to find a commercial that provides practical information about its product. Why? Advertisers know people respond to feelings rather than intellect.

Even political campaigns target our irrational nature. Hitler tailored his messages to the suppressed anxieties of the German people: participating patriotism, pride, and racist phobias. Current-day politicians use the same techniques. During the 1992 elections,

George Bush Sr. ran ads that played on white America's fear of black convicts. With this strategy, Bush defeated contender Michael Dukakis, showing that an educated modern society still responds to primitive anxieties and racial allegiances. Canadian elections are little different, as our politicians regularly exploit fears of terrorists, immigrants, even the U.S.A., to win votes in the same neurotic manner.

The sociologist Abraham Maslow designed a handy classification system for categorizing emotional appeals that he called the **Hierarchy of Needs**. His pyramid diagram places all human needs on an ascending scale with the most powerful human needs on the bottom, and the weaker, more refined at the top. According to Maslow, we have five basic needs.

- Self-Actualization Needs:** the quest to fulfill the human potential, and connect with a higher cause or meaning.
- Esteem Needs:** the longing for mastery, dominance, status, and prestige.
- Belonging Needs:** the desire to feel part of an identifiable group, such as a country, company, club, family, or a romance.
- Security Needs:** safety requirements such as shelter, clothing, and medicine.
- Physiological Needs:** basic body requirements such as air, water, food, and sex.

According to Maslow, the bottom two levels of the pyramid represent essentials that have to be fulfilled for human survival, while people may survive (but not flourish) without satisfying the top three needs.

A clever writer makes sure that a persuasive essay hits some, if not all these emotional needs. The base needs motivate people more strongly than the more refined and ethereal drives at the pyramid's top, which explains why sex and food dominate advertising.

Of course, the emotional appeal is a Pandora's box that contains all sorts of psychic fantasies, bugbears, malignancies, and delusions. The ideal persuasive essay uses emotional appeals *in addition to* sound reasons, not in place of them, as a supplement, not a substitute.

Exercises

1. Can the following propositions be developed into an argument? Why or why not? If not, rewrite them as potential arguments.
 - a) Man is a flawed, physical reflection of an eternal, ideal form. (Plato)
 - b) Fluoridated water is safe for human consumption.

- c) Immigrants often keep the cultural identity of the country they left behind.
- d) Gay marriage violates God's will and Natural Law.
- e) Safe injection sites save lives and reduce drug-related crime.
- f) Spiderman makes a better hero than Superman.
- g) American foreign policy is soaked in blood.

8. Discuss the following topics, and evaluate the quantity and quality of evidence on either side. Does the evidence on one side appear stronger? Is any evidence suppressed? What social factors influence the selection of evidence?

- Creationism vs. evolution
 - Global warming
 - UFOs
 - Bigfoot
 - Holocaust denial
 - Any conspiracy theory
9. Identify the following logical fallacies.
- a) Those hippies are blocking the logging road just so they can feel important and grab TV time.
 - b) Schools need to get back to basics: reading, writing, and arithmetic.
 - c) The government should pardon those native militants, because Aborigines have tough enough lives as it is.
 - d) Any idea coming from Jack Layton has to be bankrupt.
 - e) Hector is black, so he must be good at sports.
 - f) Canada can embrace globalization, or become an economic backwater.
 - g) If we condone stem cell research, we open a Pandora's box leading to genetic manipulation, eugenics, human cloning, and a black market in fetuses.
 - h) We should not decriminalize marijuana because it's an illegal substance.
 - i) Three of my friends took a Literature class with Dr. Clark, and each one got an "A." He must be an easy professor.
 - j) Regarded scholar, Harvard professor, and Pulitzer Prize winner Dr. John Mack believes in the alien abduction phenomenon, so there must be something to it.
 - k) Men are more logical than women, so I tend to trust Henry's versions of events more than Eliza's.
 - l) Shortly after cellphones became popular, the incidence of attention deficit disorder skyrocketed. Cellphones are giving our kids ADD.
 - m) All the girls at school are trying the Atkins diet, so it must be safe.

- n) If Canada doesn't ban the seal hunt, the Animal Liberation Front will launch a campaign of industrial sabotage and boycott Canadian goods.
 - o) A boyfriend is a lot like a dog; you have to speak to him firmly, use simple commands, and keep them on a short leash.
4. Choose a magazine or TV ad and analyze its persuasive techniques. How much time is devoted to identifying measurable benefits? How many ads rely on emotional appeals? Use Maslow's Hierarchy of Needs to identify different emotional needs.
 5. Who has a more difficult time shaving: men or women?



Evolution as Fact and Theory

STEPHEN JAY GOULD

Stephen Jay Gould was a professor of geology and zoology at Harvard University. Author of award-winning books on evolution, natural science, and paleontology, including *The Mismeasure of Man*, *Ever Since Darwin: Reflections in Natural History*, *Hen's Teeth and Horse's Toes*, and *Wonderful Life: The Burgess Shale*, Gould modified Darwin by suggesting that evolution is not slow and steady, but has stages of stagnation and rapid development. He called this the "punctuated equilibrium" theory of evolution. In this piece, Gould looks at the lop-sided evidence in favour of evolution and creationism.

Kirtley Mather, who died last year at age ninety, was a pillar of both science and Christian religion in America and one of my dearest friends. The difference of a half-century in our ages evaporated before our common interests. The most curious thing we shared was a battle we each fought at the same age. For Kirtley had gone to Tennessee with Clarence Darrow to testify for evolution at the Scopes trial of 1925. When I think that we are enmeshed again in the same struggle for one of the best-kept, mented, most compelling and exciting concepts in all of science, I don't know whether to laugh or cry.

According to idealized principles of scientific discourse, the arousal of dormant issues should reflect fresh data that give renewed life to abandoned notions. Those outside the current debate may therefore be excused for suspecting that creationists

are coming up with something new, or that evolutionists have had some serious internal trouble. But nothing has changed; creationists have presented not a single new fact or argument, and Bryan were at least more entertaining than we lesser mortals today. The rise of creationism is politics, pure and simple. It represents one issue (and by no means the major concern) of a potent evangelical right. Arguments that seemed kooky a decade ago have reentered the mainstream.

The basic attack of modern creationists falls apart on two general counts we even reach the supposed factual details of their evolution. First, they play upon a vernacular misreading of the word "theory" to convey the false impression that creationists are covering up the rotten core of our edifice. They misuse a popular philosophy of science to argue that we are having scientifically in attacking evolution. Yet the same evidence demonstrates that their own belief is not science, and that "creationism" is a meaningless and self-contradictory word. An example of what Orwell called "newspeak."

In the American vernacular, "theory" often means "imperfect fact" or a hierarchy of confidence running downhill from fact to hypothesis to guess. Thus creationists can (and do) claim that evolution is "only" a theory, and intense debate now rages over many aspects of the theory. If evolution is less than a fact, it is not confidence we can have in it? Indeed, President Reagan's argument before an evangelical group in Dallas when he said that I devoutly hope was campaign rhetoric: "Well, it is a theory. It is a scientific theory only, and it has in recent years been challenged in the world of science—that is, not believed in the scientific community to be as infallible as it once was."

Yet evolution is a theory. It is also a fact. And facts and theories are not things, not rungs in a hierarchy of increasing certainty. They are the world's data. Theories are structures of ideas that aim and interpret facts. Facts do not go away when scientists disagree about theories to explain them. Einstein's theory of gravitation did not prevent Newton's, but apples did not suspend themselves in air pending the outcome. And humans evolved from apelike ancestors whether they did so by Darwin's proposed mechanism or by some other yet to be discovered.

When one says "fact" does not mean "absolute certainty." The final word of logic and mathematics flow deductively from stated premises and achieve certainty only because they are *not* about the empirical world. Evolutionists make no claim for perpetual truth. Though creationists often do (and then attack us for a style of

argument that they themselves favor). In science, "fact" can mean "confirmed to such a degree that it would be perverse to withhold provisional assent." I suppose that apples might start to rise tomorrow, but the possibility does not merit equal time in physics classrooms.

Evolutionists have been clear about this distinction between fact and theory from the very beginning, if only because we have always acknowledged how far we are from completely understanding the mechanisms (theory) by which evolution has occurred. Darwin continually emphasized the difference between his two great and separate accomplishments: establishing the fact of evolution, and proposing a theory—natural selection—to explain the mechanism of evolution. He wrote in *The Descent of Man*: "There are two distinct objects in view; firstly, to show that species have not been separately created, and secondly, to show that natural selection has been the chief agent of change. . . . Hence if I have erred in having exaggerated its [natural selection's] power . . . I have at least, as I hope, done good service in aiding to overthrow the dogma of separate creations."

Thus Darwin acknowledged the provisional nature of natural selection while affirming the fact of evolution. The fruitful theoretical debate that Darwin initiated has never ceased. From the 1930s through the 1960s, Darwin's own theory of natural selection did not achieve a temporary hegemony that it never enjoyed in his lifetime. But renewed debate characterizes our decade, and, while no biologist questions the importance of natural selection, many doubt its ubiquity. In particular, many evolutionists argue that substantial amounts of genetic change may not be subject to natural selection and may spread through the populations at random. Others are challenging Darwin's linking of natural selection with gradual imperceptible change through all intermediary degrees; they are arguing that most evolutionary events may occur far more rapidly than Darwin envisioned.

Scientists regard debates on fundamental issues of theory as a sign of intellectual health and a source of excitement. Science is not a static body of knowledge; it is a process. The excitement of science and how else can I say it?—most fun when it plays with interesting ideas, examines their implications, and recognizes that old information might be explained in surprisingly new ways. Evolutionary theory is now enjoying this uncommon vigor. Yet amidst all this turmoil no biologist has been led to doubt the fact that evolution occurred; we are debating *how* it happened. We are all trying to explain the same thing: the tree of evolutionary descent linking all organisms by ties of genealogy. Creationists pervert and caricature this debate by conveniently neglecting the common conviction that

it and by falsely suggesting that evolutionists now doubt the phenomenon we are struggling to understand.

Finally, creationists claim that "the dogma of separate creation, as Darwin characterized it a century ago, is a scientific theory of equal time with evolution in high school biology curricula. . . . A popular viewpoint among philosophers of science belies this argument. . . . Philosopher Karl Popper has argued for the falsifiability of science as the primary criterion of its scientificity. . . . We can never prove absolutely, but we can falsify. A set of observations, in principle, be falsified is not science."

The entire creationist program includes little more than a series of attempts to falsify evolution by presenting supposed counterexamples among its supporters. Their brand of creationism, they claim, is "scientific" because it follows the Popperian model in that it is falsifiable. Yet Popper's argument must apply in the case of any theory, not just evolution. One does not become a scientist by the simple act of attempting to falsify a rival and truly scientific system; one has to attempt to falsify an alternative system that also meets Popper's criterion—it must be falsifiable in principle.

"Scientific creationism" is a self-contradictory, nonsense phrase because it is a theory that cannot be falsified. I can envision observations that would disprove any evolutionary theory, but I cannot imagine what potential data could lead creationists to abandon their beliefs. Unbeatable systems are dogma, not science. Last I seem harsh or rhetorical, I quote creationism's intellectual, Duane Gish, Ph.D. from his recent (1978) book, *The Fossil Say No!* "By creation we mean the bringing about by a supernatural Creator of the basic kinds of plants and animals by the process of sudden, or fiat, creation. We do not know the Creator created, what process He used, for He used a process which are not now operating anywhere in the natural universe. . . . This is why we refer to creation as special creation. . . . We cannot discover by scientific investigations anything about the Creator." Pray tell, Dr. Gish, in the name of your last sentence, what then is scientific creationism?

Your confidence that evolution occurred centers upon three arguments. First, we have abundant, direct, observational evidence of evolution in action, from both the field and laboratory. . . . We have a range of countless experiments on change in fruit flies subjected to artificial selection in the laboratory to the famous populations of British moths that were black when industrial soot darkened the trees upon which they fed. (Moths gain protection from sharp-sighted birds by blending into the background.) Creationists do not

deny these observations; how could they? Creationists have tried to do this by claiming that God created "basal" fossils and allowed for limited evolutionary meandering within it. Thus toy poodles and Great Danes come from the dog that can change color, but nature cannot convert a dog to a cat or a monkey to a man.

The second and third arguments for evolution—the rate of major changes—do not involve direct observation of evolutionary action. They rest upon inference, but are no less secure for that reason. Major evolutionary change requires too much time for direct observation on the scale of recorded human history. All historical sciences rest upon inference, and evolution is no different from geology, cosmology, or human history in this respect. In principle, we cannot observe processes that operated in the past. We must infer them from results that still surround us: living fossil organisms for evolution, documents and artifacts for human history, strata and topography for geology.

The second argument—that the imperfection of nature reveals evolution—strikes many people as ironic, for they feel that evolution should be most elegantly displayed in the nearly perfect adaptation expressed by some organisms—the camber of a gull's wing or butterflies that cannot be seen in ground litter because they mimic leaves so precisely. But perfection could be imposed by a wise creator or evolved by natural selection. Perfection covers the tracks of past history. And past history—the evidence of descent—is the mark of evolution.

Evolution lies exposed in the *imperfections* that record a history of descent. Why should a rat run, a bat fly, a porpoise swim, and I type this essay with structures built of the same bones unless we all inherited them from a common ancestor? An engineer, starting from scratch, could design better limbs in each case. Why should all large native mammals of Australia be marsupials, unless they descended from a common ancestor isolated on this island continent? Marsupials are not "better," or ideally suited for Australia; many have been wiped out by placental mammals imported by man from other continents. This principle of imperfection extends to all historical sciences. When we recognize the etymology of September, October, November, and December (seventh, eighth, ninth, and tenth), we know that the year once started in March, or that two additional months must have been added to an original calendar of ten months.

The third argument is more direct: transitions are often found in the fossil record. Preserved transitions are not common and should not be, according to our understanding of evolution (the next section) but they are not entirely wanting, as creationists often

claim. The lower jaw of reptiles contains several bones, that of mammals only one. The non-mammalian jawbones are reduced, step by step, in mammalian ancestors until they become tiny nubbin-like structures at the back of the jaw. The "hammer" and "anvil" of the mammalian ear are descendants of these nubbins. Could such a transition be accomplished? the creationists ask. The answer is yes, if the bone is either entirely in the jaw or in the ear. Yet paleontologists have discovered two transitional lineages of therapsids—mammal-like reptiles—with a double jaw joint—one of the old quadrate and articular bones (soon to become the malleus and anvil), the other of the squamosal and dentary bones (soon to become the incus and hammer). For that matter, what better transition could we expect to find than the oldest human, *Australopithecus africanus*, with its apelike palate, its human upright posture, and a cranial capacity larger than any ape's of the same time, but a full 1,000 cubic centimeters below ours? If God created the half-dozen human species discovered in ancient Africa, why did he create in an unbroken temporal sequence of progressively more modern features—increasing cranial capacity, larger teeth, larger body size? Did he create to mimic evolution and test our faith thereby?

Dealing with these facts of evolution and the philosophical bankruptcy of their own position, creationists rely upon distortion and rhetoric to buttress their rhetorical claim. If I sound sharp or bitter, it is because for I have become a major target of these practices.

I present myself among the evolutionists who argue for a jerky, punctuated, rather than a smoothly gradual, pace of change. In 1972 I wrote *Evolution's Edge* and I developed the theory of punctuated equilibrium. We argued that two outstanding facts of the fossil record—geologically "sudden" origin of new species and failure to see decaying (stasis)—reflect the predictions of evolutionary theory and the imperfections of the fossil record. In most theories, the fossil record populations are the source of new species, and the rate of population turnover takes thousands or tens of thousands of years. The amount of time, so long when measured against our lives, is great at once. It represents much less than 1 per cent of the span for a fossil invertebrate species—more than 100,000 years. Large, widespread, and well established species, on the other hand, are not expected to change very much. We know that the inertia of large populations explains the stasis of fossil species over millions of years.

Evolutionary theory of punctuated equilibrium largely to provide an explanation for pervasive trends in the fossil record. It is not, as creationists claim, a theory of gradual transformation

within lineages, but must arise from the different success of certain kinds of species. A trend, we argued, is more like climbing a flight of stairs (punctuated and stasis) than rolling up an inclined plane.

Since we proposed punctuated equilibria to explain trends, it is infuriating to be quoted again and again by creationists—whether through design or stupidity. I do not know—as admitting that the fossil record includes no transitional forms. Transitional forms are generally lacking at the species level, but they are abundant between larger groups. Yet a pamphlet entitled “Harvard Scientists Agree Evolution Is a Hoax” states: “The facts of punctuated equilibrium which Gould and Eldredge . . . are forcing Darwinists to swallow fit the picture that Bryan insisted on, and which God has revealed to us in the Bible.”

Continuing the distortion, several creationists have equated the theory of punctuated equilibrium with a caricature of the beliefs of Richard Goldschmidt, a great early geneticist. Goldschmidt argued in a famous book published in 1940, that new groups can arise all at once through major mutations. He referred to these suddenly transformed creatures as “hopeful monsters.” (I am attracted to some aspects of the non-caricatured version, but Goldschmidt’s theory still has nothing to do with punctuated equilibrium—see essays in section 3 and my explicit essay on Goldschmidt in *The Panda’s Thumb*.) Creationist Luther Sunderland talks of the “punctuated equilibrium hopeful monster theory” and tells his hopeful readers that “it amounts to tacit admission that anti-evolutionists are correct in asserting there is no fossil evidence supporting the theory that all life is connected to a common ancestor.” Duane Gish writes, “According to Goldschmidt, and now apparently according to Gould, a reptile laid an egg from which the first bird, feathers and all, was produced.” Any evolutionists who believed such nonsense would rightly be laughed off the intellectual stage; yet the only theory that could ever envision such a scenario for the origin of birds is creationism—with God acting in the egg.

I am both angry at and amused by the creationists; but mostly I am deeply sad. Sad for many reasons. Sad because so many people who respond to creationist appeals are troubled for the right reason, but venting their anger at the wrong target. It is true that scientists have often been dogmatic and elitist. It is true that we have often allowed the white-coated, advertising image to represent us—“Scientists say that Brand X cures bunions ten times faster than . . .” We have not fought it adequately because we derive benefit from appearing as a new priesthood. It is also true that fascist and bureaucratic state power intrudes more and more into our lives and removes choices that should belong to individuals and

communities. I can understand that school curricula, imposed from above and without local input, might be seen as one more insult on all these grounds. But the culprit is not, and cannot be, evolution or any other fact of the natural world. Identify and fight our legitimate enemies by all means, but we are not among them.

I am sad because the practical result of this brouhaha will not be expanded coverage to include creationism (that would also make me sad), but the reduction or excision of evolution from high school curricula. Evolution is one of the half dozen “great ideas” developed by science. It speaks to the profound issues of genealogy that fascinate all of us—the “roots” phenomenon writ large. Where did we come from? Where did life arise? How did it develop? How are organisms related? It forces us to think, ponder, and wonder. Shall we deprive millions of this knowledge and once again teach biology as a set of dull and unconnected facts, without the thread that weaves diverse material into a supple unity?

But most of all I am saddened by a trend I am just beginning to discern among my colleagues. I sense that some now wish to mute the healthy debate about theory that has brought new life to evolutionary biology. It provides grist for creationist mills, they say, even if only by distortion. Perhaps we should lie low and rally around the flag of strict Darwinism, at least for the moment—a kind of old-time religion on our part.

But we should borrow another metaphor and recognize that we too have to tread a straight and narrow path, surrounded by roads to perdition. For if we ever begin to suppress our search to understand nature, to quench our own intellectual excitement in a misdirected effort to present a united front where it does not and should not exist, then we are truly lost.



Excerpt from *Stormy Weather: 101 Solutions to Global Climate Change*

JOY DAUNCEY

JOY DAUNCEY is a biologist, researcher, journalist, editor, and author. Guy Dauncey writes extensively on ecological challenges and sustainable development. His latest book comes from his book on global warming, *Stormy Weather: 101 Solutions to Global Climate Change*. In this piece, Dauncey reviews the scientific evidence in favour of the climate change model.

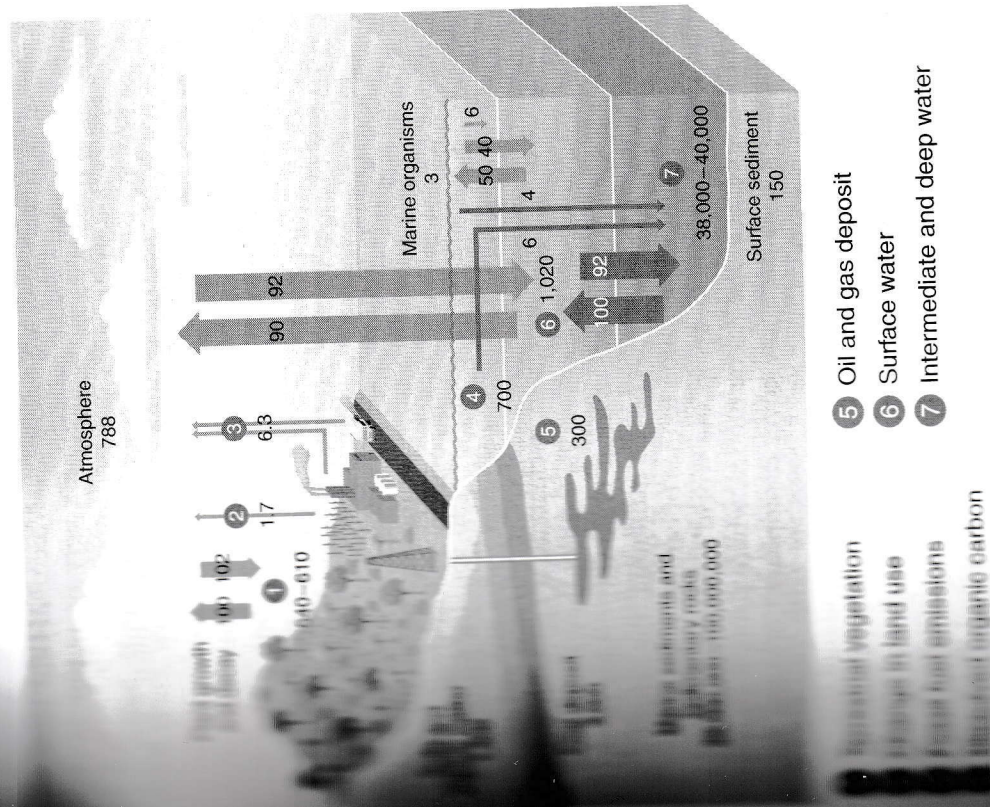
THE GREENHOUSE EFFECT

The sun pours its energy into the entire solar system, which by nature is rather cold. If you stood on a planet such as Mars, which has almost no atmosphere and no greenhouse effect, the sun would keep you warm during the day at 98 F°, but at night when the temperature fell to -189 F°, you would discover how cold the cosmos can be. Bye-bye life, hello deep-frozen astronaut! If you stood on Venus, however, where the atmosphere traps so much of the sun's heat that the average temperature is 860° F, you'd learn what "hot" meant. Bye-bye life, hello astronaut fricassée.

The difference is caused by an atmosphere that contains gases that trap the sun's heat, giving us the greenhouse effect. On Earth as far as humans are concerned, the greenhouse effect happens to have got it "just right" for the past 10,000 years. With an atmosphere that's 77% nitrogen, 21% oxygen, 0.99% argon, 1% water vapor, and 0.3% trace gases (CO₂ 275 parts per million, methane 700 parts per billion, nitrous oxide 275 parts per billion), we have been able to enjoy a pleasant average temperature of 59° F (15° C) just right for gardening and growing forests. It's the minute percentage of water vapor and trace gases that makes all the difference. They create the *good* greenhouse effect. If we had no greenhouse effect, Earth's average temperature would be 0° F (-18° C), which is bad for tomatoes and trees.

It was not always so pleasant. Water vapor, CO₂, ozone, methane, and nitrous oxide all trap the Earth's heat as it is reflected back into the coldness of space, but the gas that makes the biggest difference is CO₂. Over the past 400,000 years, there have been four ice ages when CO₂ levels fell below 200 ppm, causing the global average surface temperature to fall by approximately 5° C and plunging the world into an ice age. In all those years, CO₂ levels never rose above 298 ppm, and Earth's temperature was never more than 3° C above today's. By 2000, CO₂ levels had reached 370 ppm, the highest in 20 million years.¹ It is desperately important that we understand how the greenhouse effect works, and reduce our emissions to less worrying levels.

When the sun's rays hit the Earth, 30% of the incoming visible light is reflected back into space, 25% by clouds and 5% by the remaining 70% is captured by the greenhouse gases warming the earth and especially the oceans. Plants, algae, and ocean phytoplankton capture the sun's energy through photosynthesis, and use it to convert carbon dioxide into carbon as part of nature's carbon cycle, a process we call carbon sequestration. The carbon



According to how much of our excess CO₂ is absorbed and how much remains in the atmosphere to trap more heat.

The First Think! The Oceans

At least half of nature's photosynthesis is carried out in the oceans by phytoplankton,² and half on the land by bacteria, plants, and algae. Every year the oceans absorb around 92.4 billion tonnes of carbon and release 90 billion tonnes, storing 2.4 billion tonnes as organic carbon in the deep ocean (see diagram). Over the past 10,000 years, the oceans have soaked away almost 40,000 billion tonnes of carbon, where, hopefully, it will remain. A quarter of this

is stored as frozen methane hydrates, which have the potential to thaw as the ocean warms, triggering a very nasty turn of events. There are also concerns that in a warming ocean, diatoms may prevail over the algae that absorb carbon, stalling the ocean's ability to absorb CO_2 .

The Second Sink: The Soil

Soil is not just "dirt." It is a mass of minerals, moisture, bacteria, and thousands of other micro-organisms that absorb carbon from plants and trees as they die. Every year, the world's soils absorb 50 billion tonnes of carbon from dying vegetation and release 50 billion tonnes through decomposition. Forest destruction and deforestation weaken the soil, however, causing 1.5 billion tonnes a year to be lost to the atmosphere. In western Canada, where an old-growth Douglas fir forest is clearcut, it can take 100 years for the soil and forest to recover the carbon they had before the trees were felled, which is why it is so important to change our methods of forestry.³ Over the millennia, the world's soils have accumulated 1,500 billion tonnes of carbon, of which 1,000 billion tonnes is locked up in the world's peatlands, including 500 billion tonnes in the Arctic tundra, where rising temperatures are unlocking it as the snow cover disappears,⁴ opening another troublesome scenario.

The Third Sink: Forests and Vegetation

The world's forests and vegetation store around 550 billion tonnes of carbon, 40% in the tropical forests. Every year, forests lose 50 billion tonnes of carbon to the soil and 50 billion tonnes to the atmosphere through respiration, but they absorb 101.5 billion tonnes from the atmosphere, reducing its load by 1.5 billion tonnes. Yes, trees matter. In our warming world, however, scientists fear that by 2050, the tropical forests will cease storing CO_2 and start releasing it, adding another factor to the scary prospect of a runaway greenhouse effect.⁵

In the balanced natural carbon cycle, approximately half of the atmospheric CO_2 is exchanging with the forests and soil, and half with the global oceans, resulting in no net atmospheric increase. In the disturbed carbon cycle that we are creating, approximately a quarter is going into the soil and vegetation, a quarter is going into the oceans, and half is accumulating in the atmosphere, trapping the sun's heat, which is why we are having this little problem.

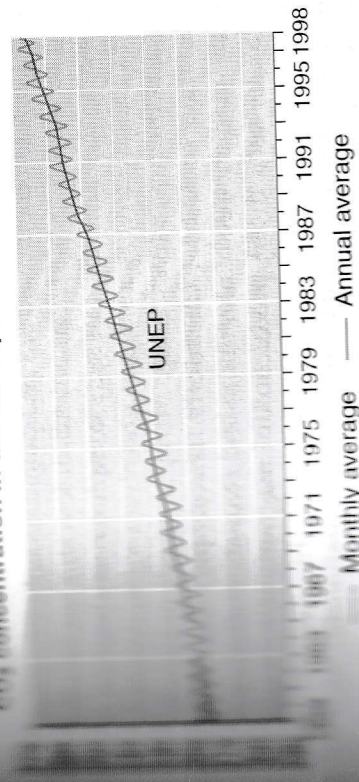
100 GREENHOUSE GASES

In the industrial age, we didn't have a problem with greenhouse gases. If anything, according to the pattern of the past 100 years, we were due for another ice age. Then we started burning fossil fuels, and we added greenhouse gases to the atmosphere. The three main gases after carbon dioxide are methane, and nitrous oxide, the three main gases after carbon dioxide, and express them as carbon-equivalents, we are talking about 10 billion tonnes of carbon-equivalent to the atmosphere. That nature would not have put there. At the present time, we are adding 10.6 billion tonnes per year by 2010.

The way to measure the impact of the various gases is by their global warming potential. This is a measure of the extent to which a gas contributes to global warming. The balance of incoming and outgoing energy in the atmosphere is the balance of the sun's natural radiation is around 240 watts per square meter (340 W/m^2); the greenhouse gases are increasing this to around 340 W/m^2 . Most aerosols (such as dust) have a negative global warming potential, though there is still much uncertainty about this. The various gases also have different global warming potentials (GWP). GWP is the standard used to compare the radiative forcing of each greenhouse gas over 100 years, using CO_2 as a baseline, which is given a GWP of 1 (see chart...).

Carbon dioxide is released by the fossil fuels we burn to generate electricity, drive the world's 530 million vehicles, and heat our homes and buildings. It is also released by the flaring of natural gas and by the production of cement. (Cement is made from limestone, the crushed shells of ancient carboniferous sea-creatures, and we turn them into patio tiles.) It is also released by the burning of forests and savannah grasslands are burned down,

CO_2 concentration in the atmosphere: Mauna Loa curve



Source: Scripps Institution of Oceanography (SIO), University of California, 1998.

and when forests are clearcut, which destroys the soil they depend on. It is released by plowing and disking when farmers turn the soil sustainably, and lose the carbon in their soil. In 1999, the world's carbon emissions from fossil fuels came to 6.144 billion tonnes. The global forest and net biomass loss added another 1–2 billion tonnes. Cement production may add 100 million tonnes, and there are other sources. The clear figures for soil loss. The present concentration is probably the highest it has been for 20 million years; the rate of increase is the highest in at least 20,000 years.

To convert carbon emissions into CO_2 emissions, multiply by 3.667 to include the addition of oxygen. Most global data are expressed as carbon, while most national and local data is expressed as carbon dioxide just to keep us on our toes.

Methane comes from a variety of sources. It escapes from landfills. Cows release it during digestion, and liquid slurry ponds release it when animal wastes break down without oxygen. It is released when natural gas escapes (natural gas is 85%–95% methane) and is released by coal mines, oil wells, sewage treatment plants, and flooded rice fields. It was recently discovered that methane is produced by rivers that have been dammed to generate hydroelectricity when biomass in and entering the reservoir breaks down without oxygen. The present atmospheric concentration is the highest for at least 420,000 years.

Nitrous Oxide is released by the use of nitrogen-based chemical fertilizers in farming and by transportation, nitric acid production, and poor manure management, and various other sources.

The CFCs, HCFCs and HFCs. Remember the CFCs (chlorofluorocarbons), the chemicals we used as coolants in refrigerators, air-conditioning systems and as propellants in spray cans. They are blowing holes in the ozone layer? Turns out they are powerful global warming gases, too. They are being phased out, but their replacements, the HCFCs and HFCs (hydrochlorofluorocarbons and hydrofluorocarbons) are also potent greenhouse gases. They also attack the ozone layer, but much less so. See Solution 8.1 for more on this muddle. Life gets complex here, because the fact that CFCs destroy is a natural greenhouse gas, counterbalancing some of their radiative forcing.

Other Industrial Chemicals. There's perfluorocarbons in the manufacture of aluminum and semi-conductors; sulfur hexafluoride, used in the production of magnesium, as a dielectric in electrical transmission and distribution and in the semi-conductor industry; and trifluoromethyl sulfur pentafluoride, that nobody knows much about.¹

Atmospheric Ozone is also a greenhouse gas. Its accumulation in the lower atmosphere (troposphere), up to seven miles high, is caused by pollutants from burning fossil fuels. Ozone in the upper atmosphere (seven to 30 miles up) is a good thing.

These are very fine dust particles or liquid droplets that contribute to global warming, forest and biomass burning, and industrial emissions. With the exception of black carbon, they have a negative radiative forcing, shielding Earth from the impact of the main greenhouse gases. The data on the next page is from the 2001 IPCC assessment report. There is not a good understanding of how the different greenhouse gases contribute to global warming. James Hansen, Director of NASA's Goddard Institute for Space Studies, thinks that black carbon, or soot, may contribute more to the overall radiative forcing.² If this is so, it changes the relative contribution of the various greenhouse gases: CO_2 —41%; Black Carbon—13%; Methane—10%; Ozone—10%; CFCs etc.—10%; Nitrous oxide—10% of black carbon comes from burning biomass and

THE ENHANCED GREENHOUSE EFFECT

When you add them to the atmosphere? But the world's climatologists and oceanographers have

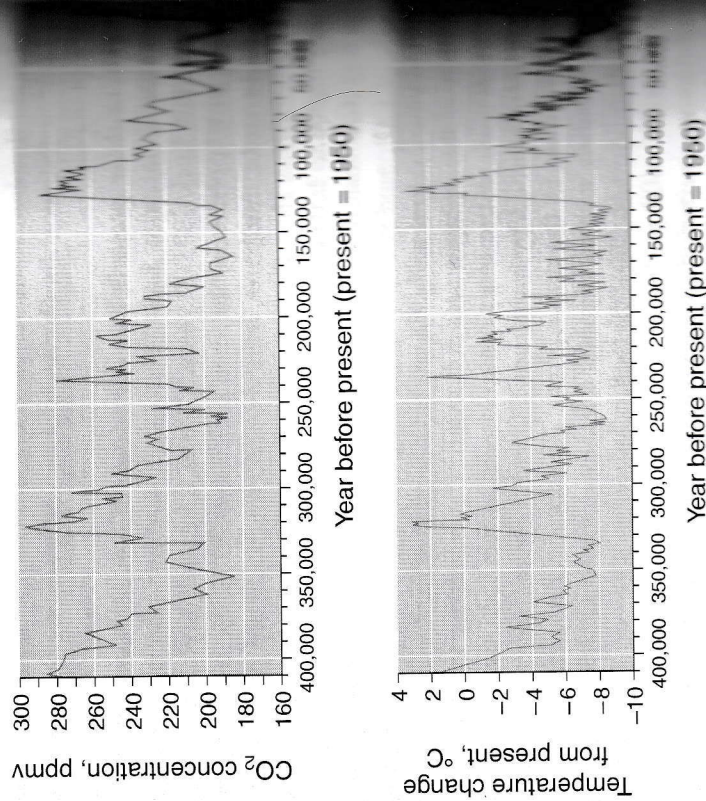
been to their projects has been to drill 3,600 metres into the ice at Vostok station in East Antarctica, retrieving frozen samples of air that are back 420,000 years.¹ When they melt the ice and analyze the trapped in it, they can produce readings for temperature, methane, and dust throughout the period. The data indicates that there have been four major ice ages, each lasting about 100,000 years. During each ice age, the temperature was lower than it has been for the past 11,000 years, and the concentration of CO_2 and methane were equally low. The connection between temperature and CO_2 and methane is almost mathematical. The temperature rose to 5° C above the recent level when the temperature rose to 5° C above the recent level, which was followed by a relatively sudden "termination" of the ice ages. When the temperature rose to 5° C above the recent level, which was followed by a relatively sudden "termination" of the ice ages. When the temperature rose to 5° C above the recent level, which was followed by a relatively sudden "termination" of the ice ages. When the temperature rose to 5° C above the recent level, which was followed by a relatively sudden "termination" of the ice ages.

When the temperature rose to 5° C above the recent level, which was followed by a relatively sudden "termination" of the ice ages.

The scientists do not yet understand why the climate shifted 11,000 years ago instead of peaking and freezing. The Vostok research shows that the recent stability (the Holocene) has been the longest in the past 420,000 years. This has been the exception, not the rule; without the warmer temperature, there would have been farming, no food surpluses, no cities, no civilizations. We must add this stuff at our peril.

The Vostok scientists believe that each warming period was with a change in the nature of the Earth's orbit, bringing an increase in solar radiation. The warming is amplified by massive increases in CO₂ and methane caused by the massive increase in flooding as the ice melts, and by a decrease in dust, the temperature rises, the melting snow and ice lose their albedo effect, allowing the earth and oceans to absorb more heat. Albedo, the name given to the reflection of the sun's light off a surface, Snow has a very high albedo, reflecting 75%–95% of the light.

Temperature and CO₂ concentration in the atmosphere over the past 400,000 years (from the Vostok ice core)



Source: J.R. Petit, J. Jouzel, et al. Climate and atmospheric history of the past 420,000 years from the Vostok ice core in Antarctica, *Nature* 399 (3 June 1999), pp. 429–436, 1999.

and forest have a low albedo (15%–20%) and absorb a lot of the sun's albedo can be as low as 5%. The climate is also influenced by changes in the albedo of the clouds—cirrus clouds have a high albedo (15%, 20%) while stratus clouds have high albedo and by particles of dust in the atmosphere from volcanoes and pollution, which have a cooling effect.

What is happening in the greenhouse today? The concentration of CO₂ in the atmosphere is the highest that it has been for 100 years.² If the increase continues, in 100 years' time it will be higher than it has been since the Eocene Epoch, 50 million years ago, when there were no ice caps at all, London (England) was a tropical island and there were crocodiles on today's Arctic islands.

There is no doubt that the Earth is warming. The evidence of global warming has been confirmed by research that looked at 15 different records of past climate, including tree rings in Colorado, ice cores from Greenland, old English shipping records, ancient Chinese records, and mud from the bottom of the Sargasso Sea.³ From 1958, the temperature in the Northern Hemisphere rose by 1.25° F (0.7° C). An analysis of more than 600 deep boreholes shows that temperatures rose by 1.25° F (0.7° C) from 1750 to 1990.⁴ In the 1990s, temperatures rose six to seven times faster, by 7.5° F (4.2° C). Since 1990, the rate of warming has increased to 10° F (5.6° C) per century. Scientists have concluded that there is only one cause for the current string of high temperatures: a natural phenomenon; the evidence points overwhelmingly to a natural phenomenon as the cause.⁵ British scientists at the Hadley Centre for Climate Research have predicted that the global temperature will rise by as much as 14° F (8° C), as the increased warming of the oceans and forests and oceans to stop absorbing CO₂ and begin to release it.

Climate change is like detective work, piecing together clues from the past, studying the present, and making informed guesses about the future. Climate modeling is very complex and there are many feedback loops to consider, including the effects of greenhouse gas cover, albedo, solar radiation, ocean temperatures, and so on. The UN Intergovernmental Panel on Climate Change (IPCC) is an elite body of scientists who work together to establish a consensus on the science of climate change. In their 2001 report, they said that "the science is telling us. In their 2001 report, they said that there is stronger evidence for a human influence," and that "the contribution of greenhouse gases 'have contributed substantially to the warming over the last 50 years.' Their estimate is that global temperature will rise by 2.5° F to 10.4° F (1.4° to 5.8° C) by 2100. Extrapolating their previous estimate of 1.8° F to 6.3° F (1.0° to 3.5° C) by 2100, they said that the warming will be even more significant."

3.5° C). Of the ten warmest years on record since 1860, eight have occurred since 1990.

THE CLIMATE IMPACTS

What will it all mean? All over the world, people have been studying how the enhanced greenhouse effect will affect life on Earth.

Prediction: The Arctic ice will melt.

Reality: Temperatures in the Arctic have risen by more than 4° F the past 30 years, twice as much as in the rest of the world. The areas are up to 7° F warmer. Arctic ice is normally up to 3 meters thick, but when Russian and US submarines compared their data, they found that it had lost 40% of its depth since 1970. At that rate, the summer ice will be gone by 2040, and the polar bears will starve to death since they will be unable to hunt on the summer ice. In 2000, a scientific cruise ship found open water at the North Pole: the last time this happened may have been 50 million years ago. The Greenland ice sheet has thinned by a meter on its southern and eastern edges. At the other end of the world, the Antarctic has been melting slowly for the past 10,000 years, but the speed of melting may be increasing. On the Antarctic Peninsula, the temperature has risen by 4.5° F over the past 50 years; between 1993 and 1997, the sea ice decreased by 20%. The IPCC scientists do not foresee any loss of the grounded ice (e.g. the west Antarctic ice sheet) during the 21st century.

Prediction: The glaciers will melt.

Reality: In Glacier National Park, the number of glaciers has fallen from 150 to 50 since 1850. In Africa, Mount Kenya's largest glacier has lost 92% of its mass, and Mt Kilimanjaro has lost 75% of its ice. In Argentina, the Upsala Glacier is retreating by 60 meters a year. In New Zealand, the Tasman Glacier has retreated by 1.7 miles since 1971. Scientists predict that by 2050, a quarter of the world's mountain glacier masses will have disappeared.

Prediction: The oceans will warm.

Reality: Between the mid-1950s and mid-1990s, the overall temperature of the ocean warmed by 0.06° C to a depth of 3,000 meters. In the past 300 years, the warming was 0.31° C, or 0.3 watts per square meter.¹ In the northern hemisphere, the ocean surface is warming by 1° F per decade, similar to the amount that the entire planet has seen over the past 100 years.²

Prediction: Sea levels will rise; coastal areas will flood.

As the ocean warms, it expands. The 2001 IPCC forecast is that sea levels will rise by 0.5 to 1.5 meters (1.5 to 5 feet) by 2100, and a rise of 3.5 to 6.5 meters (11 to 21 feet) is possible. If global warming is halted after the year 2000, thermal expansion will still raise the oceans by 0.5 to 1.5 meters (1.5 to 5 feet) by 2100. The rise in sea level will be most noticeable in the coastal areas of Bangladesh under water for two months, setting off a massive refugee crisis. The rise in sea level will also affect the coastal areas of their social and economic gains. This much sea level rise will affect far more than Polynesia and Micronesia. Thirty of the world's largest cities are close to sea level, including London, New York, and Shanghai.

Prediction: Spring will come earlier.

In Europe, an extensive study of gardens has found that the first day of spring is arriving six days earlier and fall is arriving almost five days later. In England, frogs are spawning 9–10 days earlier;⁴ in the United States, spring migrants are being recorded earlier as they reach the coast of the Pacific Northwest.⁵

Prediction: There will be increased precipitation

As the temperature warms, more water evaporates from the oceans, leading to more downpours and more snow. In 1998, Sydney, Australia, had more than 12 inches of rain in two days; Texas had more than 20 inches of rain in two days, causing \$1 billion in damage and 31 deaths; the Black Hills of South Dakota had 8.5 feet of snow in two days. In 1999, Mount Baker (WA) had 95 feet of snow in two days. In December 1998 and June 1999, a world record.⁶ The NOAA predicts that in stronger storms, the amount of rainfall per storm will increase by about 10% in recent decades.⁷ The clearing of lands for agriculture makes the flooding worse.

Prediction: More heat waves and droughts.

In 1998, the United States had its warmest June on record; Christchurch, New Zealand, had its warmest February; Edmonton (Canada) had its warmest March; Little Rock, Arkansas had its hottest May; Cairo, Egypt its warmest August. From April to June 1998, Florida, Georgia, and Alabama had their driest period in 104 years; in Texas, the driest period was over 100° F for 15 straight days. In 1999, New Mexico had its hottest and driest July on record; the eastern US had its wettest season on record, with agricultural disaster areas in 15 states. Since 1980, droughts are visiting the US,

Europe, Africa, and Asia more frequently. There will also be more colder periods in some places.

Prediction: More forest fires and insect damage

Reality: In 1998, Florida had its worst wildfires in 50 years, and Mexico had its worst fire season ever. In Canada, the area of forest consumed by fire each year has risen steadily since the 1970s. The Canadian Forest Service is predicting a 50% increase by 2010. Scientists in Alaska have reported that 20 million hectares of forest are suffering from an unprecedented attack by spruce budworm as a result of warmer weather.

Prediction: Ecosystems will be disrupted.

Reality: From Bermuda to the Great Barrier Reef, coral reefs are dying from the warmer ocean temperatures—these are the forests of the ocean, where 65% of the world's fish species live. In the North Pacific, salmon are starving as their food disappears and migrating north to escape waters that are warmer than they can tolerate. If the salmon go, so will the orca whales, eagles, and bears that depend on them for food. Alpine plants are retreating up the mountainsides in Austria. Butterfly ranges are shifting north in Europe and California. Adelie penguin populations in the Antarctic have fallen by 33% since 1975 as the winter sea ice melts. The World Wildlife Fund for Nature has warned that a third of the world's habitat will disappear or change beyond recognition by 2100, including Newfoundland, Ontario, British Columbia, Quebec, Alberta, Manitoba, and the Yukon where more than half the area is at risk.

Prediction: Tropical diseases will spread.

Reality: Malaria has been transmitted by mosquitoes in the eastern US states and in Toronto; the West Nile virus has arrived in New York; in Mexico and Columbia, dengue fever has spread to higher elevations—4,000 feet above its normal range.

Prediction: Increase in weather-related disasters

Reality: From Mozambique to Honduras, and from Canada to China, weather disasters have been proliferating. In 1998, violent weather caused \$89 billion worth of damage, killing 32,000 people and displacing 300 million. Insurance companies paid out \$91.8 billion in losses from weather-related natural disasters from 1990 to 1998, 10 times more than weather-related claims in the 1980s.¹¹ In China, 1999 flooding of the Yangtze River region killed 3,500 people.

... 5 million homes, and dislocated 200 million lives. In 2000, ... disasters rose by 100 to a record 850; storms accounted for ... natural losses, floods for 23%.¹² ... this is only the tip of the melting iceberg.

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Eating Tasty Clones: Is Cloned Steak Good for You?

RONALD BAILEY

Ronald Bailey is a science journalist for *Reason* magazine, a monthly libertarian publication that promotes itself as the magazine of "free market, free markets." Bailey is the editor of *The True State of the Planet* and

the author of *Revisiting the True State of the Planet*, as well as author of *The False Prophets of the Ecological Apocalypse*. In these books, Bailey argues that the claims of environmentalists are often unscientific.

Cloned Chance was cloned from a 21-year-old steer named Chance who obviously could not pass on his genes any other way. Second Chance or his descendants could end up on your plate one day. Since the birth of the sheep Dolly, the first cloned animal in 1996, researchers have succeeded in cloning a host of animals including goats, pigs, mules, and cows. Since producing clones is very expensive, it's unlikely that many clones will end up as Salisbury steak or a rack of lamb. Instead cloning is used to preserve and pass along genes from superior or rare animals. One day, as cloning becomes more efficient, meat and other products will be sold to consumers. Is that a problem?

People already regularly eat lots of clones, that is, cloned food products. This includes most wine grapes, and all seed-producing plants, including corn, soybeans, and apples. All of these are clones. This includes most wine grapes, and all seed-producing plants, including corn, soybeans, and apples. All of these are clones. This includes most wine grapes, and all seed-producing plants, including corn, soybeans, and apples. All of these are clones.

Cloned animals already eat the clones' forebears without ill effects. The forebears of many animal clones will already be eaten as hamburgers or barbecue with no apparent ill effects on consumers. So it seems reasonable to think that if the clones are tasty and harmless that its genetically identical twin will be equally tasty and harmless. The notoriously cautious National Academy of Sciences found last year that "There is no current evidence that food products derived from adult somatic cell nuclear transfer present a food safety concern." The NAS also found that the products of offspring of cloned animals were regarded as safe for food safety concern because they are the result of the same genetic material. Despite the lack of evidence that eating cloned animals is unsafe, the NAS recommended "that an evaluation of the composition of food products derived from cloned animals using available procedures be prudent to minimize any remaining food safety concerns. And that is being done."

The U.S. Food and Drug Administration (FDA) after reviewing the available scientific evidence issued a preliminary statement that concluded, "Edible products from normal, healthy animals do not appear to pose increased food safety concerns relative to comparable products from conven-

But in modern America, no new technology goes unchallenged. So-called consumer activists like Carol Tucker Foreman of the Consumers Federation of America caution against animal cloning. However, Foreman offers no scientific evidence that there are any safety problems with animal cloning, just pandering to our fears about new technologies.

Earlier this week, an FDA scientific panel essentially backed up safety findings of the agency's preliminary report, but left the middle on approving the use of cloned animals for food on the basis of animal welfare concerns. Cloning technology is still so crude that it often takes hundreds of attempts to produce one healthy clone.

The FDA panelists pointed out that many cloned animals never come to term and many die of defects shortly after being born. (Food safety note: The FDA already forbids putting diseased or defective animals into our food supply and these rules would apply to defective clones.) Given the panoply of animal welfare issues that could be raised with regard to using animals as food seems a bit peculiar to worry overmuch about cloning. And there can improve animal welfare too. For example, much animal pain suffering could be eliminated by cloning disease-resistant animals.

So relax—thanks to cloning, you may soon safely enjoy a medium rare New York strip from Third Chance, Fourth Chance, Fifth Chance, or even 10,000th Chance.



Danger Lurks in a Biotech World

DAVID STEELE

With a Ph.D. in genetics and molecular biology, David Steele is a molecular biologist at the University of British Columbia. He designed and constructed the world's first artificial mitochondrial gene, but chose to keep it in the common domain rather than patent it. In addition to professional research into genetics, he is also an author and activist, writing on a variety of environmental, health, and social justice issues. Although his research holds much potential, Steele is deeply concerned about the profession's ability to create a disaster.

I'm a molecular biologist. I've used molecular techniques to study heredity, evolution, gene expression and even cloning. I know the benefits of heart function (strangely enough using yeast as a model organism). I know how powerful molecular biology can

be and its contribution has been to our understanding of life processes and to our medical well-being. I'm not worried. Very worried.

Academic scientists, like most sciences, arose from intellectual biology, wondered how life works; what kind of building blocks, and how they could cull from manipulating its basic building blocks around.

We've gained unprecedentedly productive. We've learned what underlies countless diseases, and, to varying degrees, how to manipulate those operations for our own purposes. We know what we think we know what we're doing. We know what we think we know what we do not know. We know what we think we know what we do not know. We know what we think we know what we do not know.

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Genetically-engineered food organisms, for example, are piling up all around us. Successive Canadian government have over backwards to help the biotech giants bring these "products" to market. In the United States, as the New York Times has reported, Monsanto essentially wrote its own regulations. Not surprisingly, they're extremely lax. In both the U.S. and Canada, there is a little government oversight.

As the Royal Society of Canada stated in their alarming report on genetically engineered (GE) or modified (GMO) terms are interchangeable) foods in Canada, regulators and their way to accommodate the biotech giants. In their government commissioned study, the Society's distinguished panel pointed out that Ottawa is in conflict of interest. It both promotes and regulates the GE food industry. And testing is shoddy; to say the least, the trials are almost always sloppily performed; their results are virtually uninterpretable. From studies like these, we can't even tell whether the crops perform as advertised, let alone whether they pose any dangers.

Yes, the occasional GE food might have some benefits, but as a whole, we are not sure. Yes, there is the potential—over periods of just a few years—to create new superweeds and new superbugs. (In fact, they already have. Triply herbicide-resistant canola appeared in the wild—the product of successive cross-pollination of genetically-engineered varieties.) Loss of genetic diversity as specific GE crops become popular with farmers could leave us vulnerable to widespread crop failure and famine.

Occasionally, GE foods might even present unforeseen health hazards to humans. Based solely on crude chemical comparisons and unproven biological assumptions, North American regulators declare GE crops to be "substantially equivalent" to conventional brethren. These crops—such as GE soy and corn—can then be commercially cultivated and sold to consumers without any further testing. As the Royal Society of Canada's report, "this approach [of substantial equivalence] is fatally flawed for genetically modified GM crops and exposes Canadians to several potential health risks, including toxicity and allergic reactions." Still, virtually none of these possibilities are even rudimentally tested, and GE crops are planted despite the unknown dangers.

But if you think GE crops are bad, there's more.

Biotech has an even more pernicious side. Animals are being brought into the act. New cloning technologies have yielded animals who secrete drugs or spider silk in their milk. Pigs are "engineered" for human organ transplants; salmon modified to grow three times faster than their wild relatives. They are among a plethora of animals engineered to serve human purposes.

These aside, the important ethical considerations involved in individual animals in these ways, all of these technologies have obvious potential dangers. "Super salmon," for example, initially decimate wild populations. Viruses lying latent in the fish might give rise to new diseases if transplanted into humans. Doctors and Lawyers for Responsible Medicine warn, "Human transplants are 'a transplant surgeon's dream, a scientist's nightmare.'"

That's not all. Whole animals are now being cloned. Dolly the sheep was the first. Pigs, cows and others have followed. None has been without the cost of innumerable "defective" sibs—animals that die only hours, who may be born with deformed limbs or even missing organs. Even the healthy clones may be doomed to a shortened life span—we're not sure, but their chromosomes seem to be damaged. The animal that was cloned, not that of a young animal, but now, unethical scientists are racing to clone human beings. They can live with themselves, I have no idea.

Biotechnology is occurring precisely as more and more of us are being directed towards private ends. Even much of the research in biotechnology is being directed towards private ends. It couldn't happen at a faster rate. The dangers are bad enough in publicly-funded experiments, but they're subject to review by other scientists and by government organizations like the Canadian Institutes of Health Research. Private research frequently circumvents these protections. It's not unusual for research panels to sound the alarm if an experiment seems potentially dangerous. Indeed, for proprietary reasons, much research is kept secret. And, as demonstrated in the example of the BSE crisis, the drive to bring a product to market can easily trump safety.

Even the most predictable of dangers. Biotechnology may bring us new treatments and medicines that we cannot now alleviate. Yes, it may do even more. But it may also do so at any cost. Just as the victim of an accident that or dioxin-induced cancer has little interest in the safety of organic chemistry, we may well find ourselves in a similar position with even major medical breakthroughs if molecular biology is left unchecked, in the hands of unscrupulous scientists.

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disasters will be rare. But because living creatures multiply and events may quickly seem not so rare. Who knows when an ill-conceived GE organism might collapse a whole ecosystem? Who knows when a killer virus may be unwittingly unleashed?



In Defense of Tree-Spiking

PAUL WATSON

Paul Watson is an eco-activist, who works to end whaling, sealing, culls, clear-cut logging, and nuclear testing. Author of *Seal Wars: Two Five Years on the Front Lines with the Harp Seals and Ocean Warriors*, *Battle to End the Illegal Slaughter on the High Seas*, Watson is a founding member of Greenpeace and the Sea Shepherd Conservation Society. An advocate of animal rather than human rights, Watson regularly risks life to save endangered species. His use of direct action tactics has attracted him from moderate environmentalists, as is clear in his testimony the controversial practice of tree-spiking.

Tree-spiking is one of the most effective tactics yet developed to protect old-growth forests. It is a controversial tactic, but the most effective tactics are always controversial. Why the spiking? As the originator of tree-spiking as an environmental tactic, I feel it is my responsibility to defend its legitimacy.

As a child I witnessed my father break a chain saw on a huge tree shoe that had been nailed to a tree a century before and heard him over time an internal armour protecting the heart of the elderly and noble being. I was delighted. In the mid-sixties I spiked some trees to protect them from developers in my neighborhood. It was not successful. The trees were cut down, but with the small saws of two broken chain saws.

Then, in 1982, the Grouse Mountain Ski Resort in North Vancouver, British Columbia announced that they were selling the timber rights to the south slope of Grouse Mountain. The decision meant that bald eagles would bald face the mountain overlooking the city of Vancouver if the public was outraged. The North Vancouver City Council was unsuccessful in stopping the decision from going ahead. Despite petitions from school-children and appeals from prominent citizens, the resort was doomed. The resort would not relent.

I organized a small cadre of concerned eco-activists and formed the group called the North Vancouver Garden and Allotment Club. We started out early on a Sunday morning, each armed with

hammer and a backpack filled with metal spikes. The six of us were able to successfully spike some two thousand trees. At the time we pulled out every survey stake we could find. We picked over three dozen warning signs stating that the entire timber lot had been randomly spiked. Then we drove into Denver and dropped off press releases to the media.

the next day the shit hit the fan. The Vancouver *Sun* and the Vancouver *Province* both ran the story on the front page with banner headlines. We followed up by interviews with television stations—all wearing masks and identifying ourselves as spokespersons for a collective.

Within a day, the sawmills stated flatly that they had no intention of buying logs from the spiked lot. The deal was off. The Mountain Resort people were furious. We were denounced as traitors and criminals by those we thought were our allies: the Vancouver City Council, and Greenpeace and assorted other organizations. We didn't give a damn—the fact was that the trees would stay on Grouse Mountain and remain intact. It was a tactic

The Royal Canadian Mounted Police (RCMP) investigated the tactic and their sleuthing led them to our doorstep, where we were not charged. The logging interests were quick to realize that publicity over such a simple tactic would do them more harm than benefit they would derive from prosecuting us. Not only was it a tactic that worked, it was a tactic that we could get away with.

to the spiking, I had consulted a good friend who was an experienced logger. I asked him for pointers on how to spike the tree without causing any harm. He provided me with the advice that I needed. I then made enquiries of the logging industry while pretending to be an insurance investigator. I asked if there were safety mechanisms that would prevent the chain from breaking while using the operator. I was assured by the industry that such a device could not happen, for all the chain saws used had chain brakes to prevent a broken chain from whipping back into the face of the operator. I was also told that the sawmills required safety devices on their mill saws and their operators.

As an acting insurance investigator, I asked, "Is it possible for a sawmill worker to be injured if the mill saw should cut off a limb?" The answer from three different people was a definite "No." The companies involved were MacMillan Bloedel, Crown Zellerbach, and Forest Laboratories.

... I concluded that tree-spiking was a perfect tactic. It would not hurt the loggers or sawmill

in Canada and the United States. In contrast to activists such as Klein or Kalle Lasn, Taube argues that globalization is a social and economic good.

I don't think there is any question that globalization is of great benefit not only for Canada, but also for the entire world. The process of globalization creates an enviable playing field for economic growth by limiting the amount of trade barriers opening up the free market. It allows for greater foreign investment, creates more choice for consumers, and increases the level of capitalism in society.

Of course, not everyone agrees. In Canada, protectionists Maude Barlow and Buzz Hargrove fear the possibility of the loss of both Canadian industry and thousands of jobs. In the United States, an unusual merger between right-wing columnist Pat Buchanan and Democratic Representative Richard Gephardt has been attributed due to NAFTA and the Mexican economy woes. Even U.S. conservative author William Bennett has warned about the problems of laissez-faire capitalism.

Many have written negative articles and books about globalization. Barlow and Tony Clarke recently came out with a book attacking the Multilateral Agreement on Investment. Billionaire magnate George Soros has written twice in the *Atlantic Monthly* about his fears. William Greider of *Rolling Stone* threw eggs at the kitchen sink against globalization.

The primarily left-wing rants of these protectionists have a little to stir my interests. As a self-described libertarian conservative, I can think of no better option to follow other than globalization for three reasons.

First, globalization will provide an equal opportunity playing field, for potential success. As the eminent economist Milton Friedman once said, society has tried to create a private enterprise exchange economy," or competitive capitalism. Competition breeds a drive for people to succeed within the confines of the free market. There is always a risk factor involved in the risk reward is a strong motivator for most.

Second, globalization will open up the lines of international trade. No longer will a government be a babysitter to a weakness industry. If a product in Canada is inferior to a product in Korea, the smart consumer will buy the latter. Only the strongest survive, and only the inventive will live to fight another day.

Third, globalization will enhance the technological revolution. Global products like the Internet and E-mail have opened up new lines of communication in a quick, efficient manner. Industries

are readily available at the push of a button. While not everyone agrees, the technological boom has enhanced the future prospects of the world.

Globalization by the left is that it looks out for the interests of the community. Ergo, globalization will not be able to benefit everyone, and can be seen as a threat to the needs of others.

Globalization produces winners and losers in the free market. Globalization of free money and production is a socialist communal fantasy will succeed in the global economy. Individuals will succeed in the global economy on the basis of merit, hard work and creativity. There are numerous handouts in the new world markets for the poor and political failures.

Canadians are actually compassionate and you will find few voices on the left or the right opposed to the implementation of basic health care, or the implementation of human rights. Getting from A to B might be different, but the feeling of compassion exists.



The Global Economic Pyramid

is the founding editor of *Adbusters*, a magazine that exposes the dangers of capitalism and consumerism. "The Global Economic Pyramid" is a collection from Lasn's first book *Culture Jam*. In it, Lasn argues that our commitment to economic growth is akin to cancer, an addiction that is threatening to consume our planet itself.

Lasn with genial smiles stand shoulder to shoulder on a crowded sidewalk. A matrix of cordoned-off boulevards. A hundred photographers snap their picture. The seven call each other "Mister," but just about everyone else calls them "Mister." The G-7 economic summit is one of the

very few occasions where the leaders of the most affluent nations come together in one place. If aliens were planning an effective first strike on Earth, here and now would be the best time and place.

These seven men, here to coordinate their economic, financial, and trade policies, stand at the helm of the global economy, and they control more than two thirds of the world's wealth, carry the clout within the World Bank and the International Monetary Fund. They wield the power at the World Trade Organization, and their finance ministers say "Go" by lowering taxes and interest rates around the world open their wallets. When they say they are pulling the macroeconomic levers the other way, people get nervous. They cut back. Jobs are lost. Lives are put on hold.

Of course, the global economy is like the gorilla that sits on its haunches; the G-7 leaders don't have a firm rein on it. They can't through their power to direct global economic policies, and they can't reassure spectators like the G-7 summit, the leaders create a perception of mastery. And in politics, perception is everything. Leaders maintain their authority because *we believe*.

At every summit the focal point of discussion is how to maintain economic growth. Growth is the *sine qua non* of capitalism. Without growth the global economy as it is now structured makes no sense. There seem to be no alternatives; there *is* an alternative—one that has never been discussed at any summit.

TWO SCHOOLS OF THOUGHT

The view that in good times or bad, growth will set us free is the argument coming from economics' so-called expansionists. Expansionism remains the dominant economic paradigm for expansionists (sometimes called neoclassical economists) and dominant economic policymakers of our time. They are the professors at our universities, the policy advisers to our governments, the members in most of the think tanks. Their confident logic shapes the strategies by which we live.

The competing view of global economic reality—the ecological worldview—is the new kid on the block. Its vision is not quite formed, its logic is a little less confident. Its proponents probably make up fewer than one in fifty of all the practicing economists, economics professors in the world today. Though rapidly gaining acceptance, ecological economics has so far been little more than a minor irritant to its dominant expansionist rival.

The two worldviews are chalk and cheese. Or, if you prefer, heaven and hell.

Ecological economists (also known as bioeconomists) foresee an end to the growth paradigm. They warn that we have reached a unique juncture in history—that, ecologically speaking, the world is already in a state of ecological emergency. Further expansion will lead us into an ecological nightmare, a world of ecological collapse.

Ecological economists, by contrast, see growth not as a problem but as a solution to our economic woes. There is no reason why growth should stop. Growth is good, they claim. "There are no . . . limits to growth," they say. "The capacity of the Earth that are likely to bind at any time in the future," pronounced Lawrence Summers, former president of the World Bank. "There isn't a risk of an apocalypse, of global warming or anything else. The idea that the world is heading over an abyss is profoundly wrong. The idea that there are limits on growth because of some natural limit is a

fundamentally and unbelievably arrogant view is shared by other people who put their faith in technology. 'If it is easy to substitute factors for natural resources,' says Nobel laureate Robert Solow, 'then . . . the world can, in effect, get along without natural resources.' No exhaustion is just an event, not a catastrophe." A leading economist, once boasted: "We have in our hands—in our technology—the technology to feed, clothe, and supply energy for a growing population for the next seven billion years."

Ecological economists, of course, these are fighting words. They are ecologically irresponsible and just plain false. William F. Ogburn, author of *The Ecological Footprint* and a leading spokesman for expansionism, warns that the fivefold increase in world population since World War II (and a twentyfold increase in the ecological footprint) has produced an unprecedented level of material and technological expansion between the ecosphere and the human economic system. He points out that 40 percent of terrestrial and marine photosynthesis have now been diverted to the production of fossil fuels, climate change, deforestation, and the loss of biodiversity as unambiguous evidence of our ecological crisis. He calls on us to stop stressing our ecosystem or die. In 1992, the United Nations Conference on Environment and Development, the World Academy of Science directors released a report stating that human activity is proceeding at a rate that is unsustainable and catastrophic path which will destroy the earth's life support systems upon which life depends. Overpopulation, inappropriate technological applications and ecological degradation are changing the biophysical features of the Earth.

Ecological economists accuse expansionists of pawing the planet's resources, of "liquidating" the planet's irreplaceable natural

capital for short-term gain. Robert Ayres, in the *Journal of the International Society for Ecological Economics*, writes: "... there is even indication that human economic activity, supported by perverse trade and 'growth' policies, is well on the way to perturbing our natural environment more, and faster, than any known event in planetary history, save perhaps the large asteroid collision that may have killed off the dinosaurs. We humans may well be on the way to our own extinction."

ECOLOGICAL ECONOMICS

Assume for a moment that our survival is indeed threatened. What do we do? How can we address that threat? An obvious answer is to pursue sustainability. To design a new economic system that gives us what we need without sacrificing the well-being of future generations. For ecological economists (or bioeconomists), leveling the playing field between generations is *the* big challenge of our time. Nothing else comes close. And the solution is nothing short of a cultural revolution—an about-face in our values, lifestyles and institutional agendas. A reinvention of the American dream.

Expansionists see the pursuit of sustainability as a much simpler proposition: Create as much wealth as possible by freeing up markets, privatizing government services and eliminating barriers to trade. This will, according to their theories, produce a new round of economic expansion that will create the wealth we need to tackle environmental degradation, poverty and other economic woes.

But there's a flaw in the expansionists' argument. They have no accurate way of measuring the economic progress they keep talking about. Their only measure of growth is the Gross Domestic Product (GDP), and it is seriously flawed.

Consider: When the *Exxon Valdez* spilled its load of oil onto the Alaskan coast, \$2 billion was spent trying to clean up and minimize the ecological damage. That money then circulated throughout the American economy, resulting in a significant increase in the GDP. When the Gulf War broke out, America's GDP rose again. Money changed hands. The country became "healthier." Indeed, every time there's a car accident or a newly diagnosed cancer patient, whenever personal or societal catastrophes occur, the GDP goes up and the economy "gains."

Consider: Walking, biking and using mass transit contribute less to the GDP than using a car. Trains contribute less than airplanes; an extra blanket or sweater contributes less than raising the thermostat; one-child families contribute less than six-child families; eating potatoes contributes less than eating beef; starting a vegetable garden contributes less than buying produce at the

supermarket; staying home to raise your daughter contributes less than getting a part-time job at Wendy's. Indeed, the GDP fails to assign any value at all to unpaid or volunteer work. Work done by tens of millions of North Americans simply does not show up on the expansionists' radar. Similarly, the GDP fails to assign any value to declining fish stocks or disappearing forests. It's as if these negatives simply don't exist.

The GDP measures "goods" but not "bads." It cannot distinguish economic benefit for social gain from economic benefit for social loss. Conducting economic policy based solely on the GDP, says Canadian political scientist Ronald Coleman, is like driving your car without a gas gauge. The engine seems to be running fine, but for how long? There's no way to know.

That's why ecological economists have spurned the GDP and developed their own measures of economic progress. The three graphs on the next page show the GDPs of the U.S., U.K. and Germany all soaring merrily upward from 1955 through the 1980s. However, a more accurate measure of economic progress, the ISEW (Index of Sustainable Economic Welfare), developed by Herman Daly and John Cobb in 1990, tells another story. When some of the "bads," such as pollution, depletion of nonrenewable resources and car exhaust related health costs, are factored in, a very different picture of the economy emerges. The U.S., German and U.K. economies all show no improvement in economic welfare since the 1970s. In fact, economic welfare levels off and starts falling quite dramatically in each country.

The ISEW (as well as the GPI, or Genuine Progress Indicator, pioneered by the San Francisco think tank Redefining Progress) explains the expansionists as a bunch of eager beavers without a well-considered business plan, pseudoscientists urging the world to follow their lead before they themselves have clear bearings. Ecological economists cling to their mathematical models like children to their teddy bears. They operate in a kind of academic isolation that does not acknowledge the effects of their policies on the real world. Their world is the world of "revealed preferences" and "rational expectations," of "perfectly voluntary exchange" and "negative externalities" that can be dismissed. Their world is not our world. Their world does not exist.

"The difference between science and economics," says Ferdinand Braudel in *Truth and Economics*, "is that science aims at an understanding of the behavior of nature, while economics is involved with an understanding of models—and many of these models have no relation to any state of nature that has ever existed on this planet, or one that is likely to exist between now and doomsday. The word that comes to mind when confronted by these fantasies is fraud."

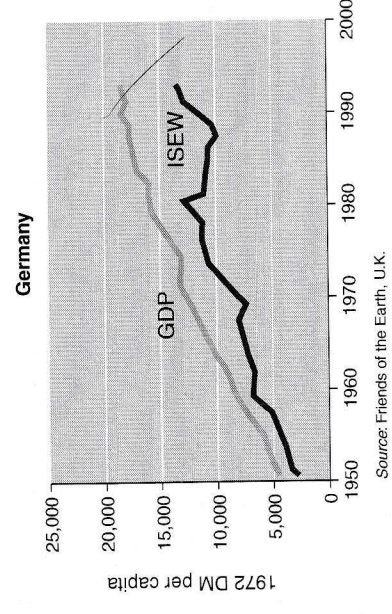
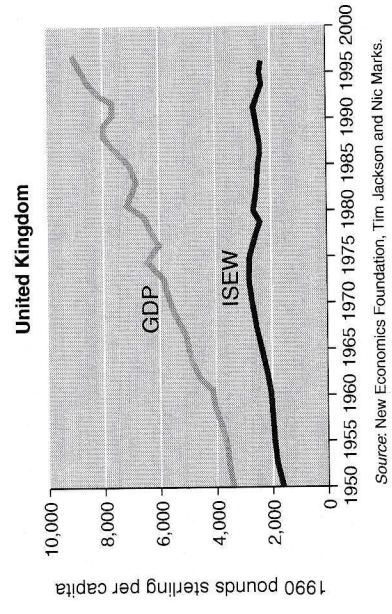
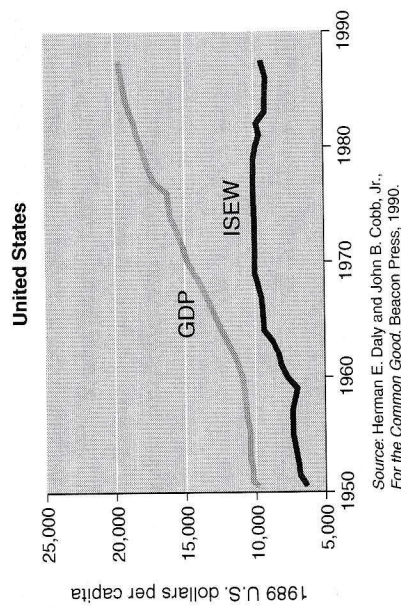
THE DOOMSDAY MACHINE

In 1996, news stories of a bizarre and tragic wholesale fraud began filtering out of Eastern Europe. In Bulgaria, Romania, Russia, Serbia and Albania, citizens who had sunk their savings into investment schemes that promised money for nothing got a glimpse of the dark side of the free market. In Albania close to 90 percent of the dirt-poor population had put some or all of its money in "foundations," which were actually simple pyramid schemes. No one knew what they were investing in, exactly, but the pitches were electrifying, the promised returns too enticing to resist: cars, tropical vacations, triple your money in three months, a new and better life for everyone. The people believed. And why not? "Albanian money is the cleanest in the world," reassured President Sali Berisha. If the government endorsed these schemes, surely they were legitimate. Many Albanians took the plunge. They bet the family fruit stands, sold their homes and their livestock. In Albania, as elsewhere in post-communist Europe, new investors eventually dried up and the markets began failing. Finally, the house of cards came down. People lost. They had nothing left. Albanians collectively lost a billion dollars—three times the national budget deficit. They had trusted their government and they had been betrayed.

The response in the West was predictable. Bemused pity might best sum it up. We shook our heads at those poor benighted bastards who had been persuaded to "bet on miracles."

But how different is *our* economic fable? Don't we trust our financial advisers, our expansionist economists, our political leaders as blindly as Albanians trusted theirs? Most of us have put our money where our money is. It's not in the bank where we left it. The bank injected it into the bloodstream of the global money market. Vast sums move through this market every day and collect in certain hot spots. After a Canadian company announced it had opened the world's biggest gold deposit in the Indonesian rain forest, everyone wanted in. The penny stock soared to nearly \$300 a share—until allegations of fraud surfaced and the house of cards began tumbling down, and with it billions of investor dollars, leaving hundreds of millions invested through pension funds, mutual funds into mutual funds and retirement plans, assuming they were to be secure, broad-based, blue-chip investments. But what's to be done if some of your money may be bolstering the economies of nations that are often atrocious, even genocidal regimes.

About half a million people around the world wake up every day to face the world of people, work and nature, and play money



Two different ways of measuring economic progress: Gross Domestic Product (GDP) and the Index of Sustainable Economic Welfare (ISEW). When pollution, depletion of nonrenewable resources, car exhaust-related health costs and other social and ecological costs are subtracted from the GDP, then economic "progress" levels off around 1975 and starts falling thereafter.

games in cyberspace. They invent new instruments (futures, bonds, derivatives, arbitrage, etc.), each with its own risks and rewards creating \$50 in play money for every \$1 worth of real products and services actually circulating in the world. They further inflate the amount of "money" in the system by borrowing from each other and bidding up prices. Trillions of dollars slosh around this system every day making billions of dollars of virtual profits for the nimble and the quick. Even as these people sleep, their computers continue searching for margins of profit, automatically triggering buys and sell-offs when the conditions are right.

At the U.S. investment house Kidder Peabody, a single trader reports \$1.7 trillion in phony trades over two years before he is caught. At Barings Bank in Britain a young broker, praised for having an "almost unique capacity" to produce big profits without taking significant risks, loses \$1.3 billion in one month. He bankrupts the 233-year-old bank with his enthusiasm for Japanese futures.

Those famed, highly speculative "derivatives" aren't just the special currency of young sharks. The accounting firm of Ernst and Young revealed in 1997 that nearly a third of the investment funds it had been tracking included derivatives. Overall, 97 percent of the world's monetary transactions are now speculative. In 1970, the figure hovered around 30 percent.

Blind trust is a scary thing. We give up control of our money. We assume the markets will hold and our nest eggs will grow when in truth our investment portfolio is often held together with baling wire and blind faith.

And what about the global economy? Is it viable? Is there enough real "estate," real factories, real jobs, real gold mines? Is there enough good topsoil? Are there enough fish left in the sea? Is there enough real economic progress to keep the whole thing growing? And if so, for how long?

On October 27, 1987—Black Monday—the Dow Jones Industrial Average fell 554 points, the biggest single-day plunge in ten years. Circuit breakers on the NYSE kicked in and shut down trading. Just days earlier, Hong Kong's Hang Seng Index had suffered a similar crash, joining a half dozen Asian economies that had fallen or would soon fall in a domino effect of pessimism. Americans—a plucky lot—rebounded quickly. Analysts here called the dive a "correction." Investors jumped back in and the Dow was soon soaring toward 10,000 again, as if nothing had happened. But something *had* happened. The synchronized crashes showed the awesome degree to which world markets are now codependent; how the global economy is now one entity. Everything we do has global implications. Crisis is never far away. The Japanese, Chinese and Asian

"tiger" economies have proven much more precarious than we thought. Our own economy depends, to a great extent, on managed public moods and panic held at bay by carefully scripted reassurances from the G-7 leaders and Alan Greenspan at the U.S. Federal Reserve. What would happen if, on top of our current insecurities, the fear of escalating climate change (planetary ecology and economy caught in a deadly downward spiral) suddenly became real to us? Here's a good guess: a crash to dwarf Black Friday and Black Monday. You've got to wonder how long we can continue playing the neoclassical expansionist game, living off our natural capital and calling it income, before the pyramid collapses and the leaders head for the hills.

The Albanians may have been naive, but their actions were understandable. They had to do *something* with their money because it was rapidly losing its worth. The Japanese, Koreans, Malaysians, Indonesians, and to some degree the rest of us are now caught in a similar vise. We're worried about the future. We don't want to suffer in our old age. We want a secure sum to retire on. We're nervous and impatient. We want our money to grow quickly. So we try stocks, bonds and futures, and hope our nest egg is growing. "Invest my money wisely," we tell our brokers and we place our future in their hands.

Pyramid schemes depend on a continuous supply of dupes (early contributors being paid from the pockets of later ones). When no new contributors can be found, these schemes fail. In the expansionist model of the global economy, future generations—our children and our children's children—are the dupes. As supplies of clean water and air grow scarce, as forests, cod, salmon and wildlife vanish, as climate instability escalates, we will eventually reach a point where one generation suddenly balks, unable to buy into the scheme. How close we are to that moment of truth is anybody's guess.

Recently I saw a TV news item about a town in Nebraska where the accumulating smoke from wood-burning stoves was making the residents sick. Asthma sufferers had to be hospitalized. Children couldn't play outside after school. A local bylaw was hastily enacted to restrict wood burning to Monday, Wednesday and Friday afternoons. Many townspeople were outraged. How can someone tell me what to do in my own home! they howled. What's next? You're going to tell me I can't drive my car? Can't I have a gun? Can't I have a second child, like in China?

I am well acquainted with this type of response. Every year the Green Foundation tries to purchase airline for its "Buy Nothing Day" TV campaign, which asks Americans to put away their credit cards on the last Friday of November. Every year every major

me calling you Angel," he wrote in one of his last notes because you're so nice to me and yet we've never met. He told me that he knew there are people like you still growing up in America.

Riggs's surprise at her kindness was curious. It must have been the distance American soldiers had traveled since World War II, when Yankees were so famous for their optimism. It was the end of the century, and Riggs was an African American who lived in the bleak heart of downtown Detroit, where he had been subsumed by a stalwart determination to simply survive. "I have no intentions of becoming one of this war's casualties," he wrote to his mother in Las Vegas. "With the Lord's grace and guidance, I'll walk American soil once again."

On March 16, 1991, Specialist Riggs strode jubilantly across an airport tarmac in Fort Bliss, Texas, and gave his twenty-five-year-old wife, Toni Cato Riggs, a tentative "D'ya still love me?" Toni had driven across the country to welcome him home from his three-year-old daughter, Ambere. For that, and for being home, he was immensely relieved. After spending several months in the military, he was scared and bored senseless, he'd made it to safe ground. He was what was heartening: some french fries, a little romance, and he got back to Detroit, a move *out* of there, to a small town where he offered by the army on a base in Warren, Michigan.

While Riggs was away, Toni had returned to the city to her home where her grandmother, Joan Cato, had raised her. The wooden house on once-genteel Conley Avenue in Detroit was still the same, yellow ribbon she had tied to the porch slumped in the rain as the couple slogged back and forth between the house and Riggs's Nissan Sentra, filling it up with their belongings the first day back in the city. By two in the morning, the house was crammed with old furniture, Ambere's toys, Toni's schoolbag, and Anthony's army stuff, just one more haul to do, that stretch of the shoulders and a fitful sleep. Anthony was still when Joan Cato noticed that the porch light had gone out. She went to the doorway to switch it back on. She stopped, startled, jerked into stillness by gunfire. In Detroit, this was a predictable terror, not shocking so much as depressing. She it stopped, Joan and Toni peered through the screen. They saw a Nissan pulling away. Oh, Lord, this was violence coming home. Anthony was on the ground. He was hit. Just like that. That impersonal. Within moments, he was dead.

It didn't take long for the dispiriting irony of this urban murder to be grasped by every politician and columnist in the nation. Within twenty-four hours, Detroit City Council's Maryann Mahaffey had pegged it "the great American tragedy."

At the Senate subcommittee hearing on the Brady Bill, a seven-day waiting period for handguns, Specialist Riggs was repeatedly as the day's bitterest case in point. Never had a man died in a combat zone. "The statistics show that during every 100 hours on our streets, we lose three young men than were killed in 100 hours of ground war in the Gulf," Health and Human Services secretary Louis Sullivan testified. "Where are the yellow ribbons of hope and of hope?" he wanted to know. A spokesman for Detroit's Mayor Young gave a statement. "A new warfar needs to be at the home front," he said, "... so this gallant young man had died in vain."

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matching the bullets in the fallen soldier. They put through a tradition trace. The ownership came back to someone named Shelby, who proved to be a local street tough and a crack currently on probation. Hauled in and grilled, Shelby told that turned this senseless urban murder on its head. He had a gun, he said, to nineteen-year-old Michael Cato, who was a friend. Cato was also, as it happens, the son of his mother's Paula, and the brother-in-law of Anthony Riggs, Cato's shooter, Shelby said. But it wasn't his idea. The idea had to Toni.

Michael Cato was arrested on March 25, on the strength of Shelby's confession. Swiftly giving in to his predicament for talent for lies, he explained what had happened. Toni's older sister, the smarter and tougher-minded of the two, protected Michael since they had been neglected as children by a drug-addicted mother, had asked him to murder her husband, would split with Michael, she said, her two-hundred thousand payoff in life insurance. Then they could get out of the neighborhood something better. So Michael borrowed Antonio's gun and plan went into motion.

Detroit was stunned. The pundits were speechless. What were there to fashion about this little twist? The family. The violence had nothing to do with men at all, it had been arranged by a woman. Instantly, the voices of anguish fell in place of a nation's impassioned pleas for reconciliation. A couple of news stories reporting the gossip of neighbors that Riggs was promiscuous. She had been "runnin' around with men." It was whispered that she had herpes. Another rumor that she was pregnant. "That's a fact," a Conley Avenue resident named Ollie Hicks told *USA Today*, though it wasn't. "I always she was selfish and self-centered," said Anthony's mother.

Army Sergeant Gary Welliver told a reporter that he thought of it, when Toni met Anthony in Fort Bliss she'd told him she wanted a divorce. "An interesting way to get greeted," he said sarcastically. Reporters unearthed the unsavory fact that she was already married to another man when she married him. She still hadn't divorced Marcus Butler, Ambere's father. He found out by interviewing her cousins and girlfriends that she was a restless, disconsolate woman who didn't love Anthony and wanted to be an army wife in the suburbs. Anthony told her she described Toni's unhappiness in a letter to his mother that Toni had wrecked my car again," he wrote Lesley. "I don't know what's on her mind. . . . Mom, I would put my head through the neck of a hot sauce bottle to please her."

They were sitting, through the details from the papers, now looking up at an unimportant true crime fluff, might begin to glimpse the story in Toni and Anthony's marriage, how one man was the woman stifled, and both were trying to assemble from what shreds of opportunity the inner city provides. Toni took the legitimate route and joined the army. Toni went on a route and arranged a shooting, like the ones she saw every day.

It is a fact that Riggs was embroiled in familial rancor and fell victim to a kind of no meaning for the citizenry of Detroit. "What was he a soldier?" the Reverend James Holley of Little Rock Church said, referring to his arrangement of the funeral. "The way the media did, that this was the kind of . . . violence that has grown used to." Reverend Holley did not mean the violence to his community in which women are principal players, but to his community and sisters and daughters. He wasn't referring to abuse, infanticide, spousal assault, or school yard and neighborhood violence. He did not take, for his reference point, the violence against women arrested for violent crime in America the way that others of the thousands of others whose violence was not reported or went unremarked upon. He meant masculine violence, the violence of illicit, heroic or profane, but publicly engaged men. "It makes me think I need to take a long look at my community," he concluded, of his initial assumption about Riggs's fate. "It comes to the point that we just automatically perceive this way?"

A society perceives about violence has less to do with a man than the lenses we are given through which to see. Before the twentieth century, the man who beat his wife or his child was not seen. That was the woman who lashed her dog or, in some cases, her newborn to die of exposure. Rape is violent, but it is not until many years have we perceived that a husband might be violent. The violence that words inflict is newly perceived, the violence of "harassment" and "hazing." Our perception of violence is subjective, and changeable. What the citizens of Detroit perceived by" as Reverend Holley put it, was one dimension of human behavior. Boys were gunning down boys, to be sure, and women were contributing their share to the cycle of violence and pain.

Against the majority of child homicides in the United States, the share of physical child abuse, an equal rate of sibling violence and assaults on the elderly, about a quarter of child deaths, an overwhelming share of the killings of newborns,

and a fair preponderance of spousal assaults. The question is how do we come to *perceive* what girls and women do? Violence is still universally considered to be the province of the male. Violence is masculine. Men are the cause of it, and women and children the ones who suffer. The sole explanation offered up by criminologists for violence committed by a woman is that it is involuntary, the result of provocation or mental illness, as if half the population of the globe consisted of saintly stoics who never succumbed to frustration, or greed. Though the evidence may contradict the claim, the consensus runs deep. Women from all walks of life, at all levels of power—corporate, political, or familial, women in conflict and on police forces—have no part in violence.

It is one of the most abiding myths of our time.

The notion that women are a homogeneous species of nurturant souls has myriad wellsprings, but the deepest, perhaps, lies in do with our basic conception of the body.

Violence, we believe, is implicit in the construction of the male chest-beating ape evolved into the soldier, the rapist. Men are propelled into conquest by a surge of testosterone, and build the blocks of power on the strength of their physique. Research into show that women are tougher, longer-living, more tolerant of pain but research is dry and pedantic. Literature rejoices in the death of female flesh, its yielding form, its penetrability. The female body fosters life itself. Women do not physically thrust and strut and dominate. To picture women's aggression, men would have to picture women's bodies bereft of the erotic, the maternal, the divine. No such sacrifice is required in conjuring male aggression. Men and hormone are the twin pillars upon which all our darkest human urges stand: lust, rage, jealousy, revenge, the craving for power, the quest for control. Dark urges, and yet the capacity to express them is also held up as a matter of masculine strength and of valor. "It is highly probable," wrote Anthony Storr, one of the century's most famous theorists on violence, "that the unconscious superiority of the male sex in intellectual and creative achievement is related to their greater endowment of aggression." Masculinity, according to sociologist James Messerschmidt, "emphasizes practices toward authority, control, competitive individualism, independence, aggressiveness, and the capacity for violence."

A 1996 book about the primate origins of human aggression, *Demonic Males*, made it clear in the title that, whether we begin with creatures of earth or as creatures of God, it is men who wreak havoc. Men destroy, women create. Men are from Mars, women from Venus. The gender dichotomy is remarkably enduring and surprisingly crude.

So what is its basis in fact?

Over the last twenty years, a host of scientific research projects have zeroed in on the physical underpinnings of human behavior, with results that pose a sharp challenge to the biological maleness of aggression. Testosterone, the oldest chestnut, has fallen into disrepute of late, as laboratory experiments call the causative effect of the hormone into question. One comprehensive literature review of announced research to date to be utterly inconclusive on the influence of male hormones on violence. A major flaw in the research has been that testosterone, like adrenaline, increases in people exposed to conflict. The populations most often tested for it are prison inmates, who already have higher levels because of where they are—in an edgy, tense, combative cage. "The outcome of competitive or competitive encounters," noted the reviewer, "can raise or decrease testosterone levels." Elevated levels have been measured in *female* prisoners, as well as in winners of "a cash prize" in tennis tournament, recipients of medical degrees, and the triumphant competitor in a wrestling match. "Does the hormone modulate the behavior," asks psychologist David Benton, "or does winning and winning increase the release of the hormone?" For all its celebrity, testosterone is an elusive player in this game. It explains nothing, after all, of Toni Cato, or the mother who pumpe her child, or the girl in a gang with a switchblade.

In fact, a more compelling culprit than hormones in violent behavior may be the wiring of the human brain, in a way that does not discriminate one sex from the other. There is fascinating work on the link on the effect of head injury on the human propensity for aggression. Frontal lobe damage, for example, can cause perfectly sane people to lose their impulse control, which is usually governed by the cerebral cortex. They revert to the most primal emotions, reacting from annoyance to homicidal fury in a matter of seconds with no mood in between. We know this in its less extreme form as a "hair-trigger temper." Its more voluble expression is called "psychotic aggression" or "rage attacks." But why would it affect only men? It doesn't. Pauline Mason of Toronto was driving on a highway in 1992 when a spring flew off a transport truck, smashed through her window, and struck her head. She went amnesiac for several months, was permanently blinded, and grew wildly and irrationally violent, to the point where her scared spouse initiated legal proceedings.

How many other women undergo this Jekyll and Hyde transformation? Thousands? The scientific literature is mum. Men are standard bearers of violence, and masculine violence the

what happens to boys at the preschool level is that they begin to engage in much higher levels of "playful aggression" than girls do. What parents are noticing is that their boys have begun to dress, rehearse for gender, engaging in varieties of masculine gesture and display. This sort of aggression, playful in preschool and combative by high school, has nothing to do with the preconditions of criminal *motive*. It has to do with posturing. James Messerschmidt calls it "doing gender." Boys play rough because we expect them to play rough. Seventy percent of respondents to a 1968 survey conducted for the National Commission on the Causes and Prevention of Violence said that "they believed it was important for a boy to have a few fist fights while he was growing up." Evidently, most boys do. Every year since 1976, about half of all men in the United States have answered "yes" to the question "Have you ever been punched or beaten by someone?"

"Where I grew up, in Mississippi and Arkansas," wrote the novelist Richard Ford in 1996, "to be willing to hit another person in the face with your fist meant something." What did it mean? That you were brutish, power-mad, in love with someone else's pain? "It meant you were—well, brave . . ." wrote Ford. "As a frank, willed act, hitting in the face was a move toward adulthood; the place we were all headed—a step in the right direction."

Aggressive display is a cultural practice, and even within the United States there are cultural variations in the degree to which we deploy it. Researchers at the University of Michigan recently explored the link between elevated violence rates in the southern United States, for example, and "the culture of honor." This southern belief, which endures long past the outlaw of duels, is that men must be met with an aggressive defense. Theorizing that the culture of honor obliges southern men to behave more violently than northern men, the researchers divided a group of students according to where they'd been raised. The students—unaware of the experiment—were bumped in a corridor and called "asshole." Northerners reacted mainly with amusement, whereas southerners more often got angry. In a second experiment, the students were put on a television course with the experimenters in the hallway, setting up a case of chicken, to see whether they, or the experimenter, would step in of the way first. Again, northerners were quicker to give way, inclined to feel that losing the game "damaged their reputation and masculinity."

British men follow a different model for masculinity. Their ideal is more likely to be "a stolid, pipe-sucking manhood, unmoved by passion or excitement," admirable for showing reason and self-restraint. A review of violence rates in Western countries, anthropologist

Stephen Spencer speculated that the British rates are much lower because of their cultural ideals. As Leyton points out, certain factors that contribute to the commission of serious violence—individual pathology, life stresses, childhood maltreatment, and social upheaval—are constant in every society. But levels of displayed aggression fluctuate, according to cultural norms.

What would happen, then, if women felt entitled or compelled to punish themselves physically in a public arena, if standing up to fight was not just a manly ideal but a womanly one as well? Would they find the opportunity because they are not *inherently* aggressive—rather quick to anger, nor desirous of power, nor keen to brandish their own strength? In fact, the capacity of women to use masculine violence emerges very clearly in those societies that sanction its expression. Anthropologist Victoria Burbank has found that women engage publicly in physical aggression in more than eighty contemporary societies around the world, with other women—their rivals for status, dominance, and resources—the most frequent targets. Like men, women's aggression differs in severity and purpose from place to place. On Margarita Island, off the coast of Venezuela, the anthropologist H. B. Kimberly Cook "found that women are *more* violent than men in the expression of aggression." They engage publicly in assaults and verbal assaults, with "the most common theme underlying fights between women [being] paternity issues" and status. And men, they use various techniques of "social control," or what she calls "*parar el macho*," to quell male machismo. "When I first got married," one twenty-two-year-old fisherman told Cook, "I used to disrespectfully to my wife. . . . One day my mother took a board and hit me across the mouth. Blood came out of my lip. I cried and said, 'Mama, why did you hit me?' She answered, 'So that you learn respect for your wife.'" Men are slapped, kicked, hit, and berated, and they don't see such behavior as trivial or unfeminine. It is a point of pride for the women. "A woman's physical strength and ability to defend herself is . . . central in the self-concept of women."

The same is true of Aboriginal women in Australia. Victoria Burbank observed 174 fights in one community and found that women started nearly half. When women were physically injured during their aggressions were women about half the time. Noting that Western theories, metaphors and stereotypes of female aggression and victimization frame our understanding" but do not reflect universal truth, Burbank asked the women how they saw their behavior. They viewed it as natural. Aggression was "the way it is, if not inevitable, outcome of anger," for both men and women and wasn't seen as socially deviant.

Anthropologist Maria Lepowsky studied aggressive acts on the island of Vanatinai, near New Guinea, where men and women are held to be equal in economic, political, marital, and social relations. "Males and females experience equally strong emotions of envy, jealousy, frustrated desire and rage," she observed. "There is no perception that a man's feelings of anger are stronger than a woman's." But equality in itself doesn't make women physically violent. In that particular culture, both sexes are expected to engage in verbal and physical aggression. Instead, they may use magic, witchcraft, and indeed that is the most prevalent form of violence on the island. Lepowsky only witnessed five incidents of physical violence in ten years of field research. Four of the fights were instigated by women; two of their victims were sexual rivals.

P E N D I X

A

Common Grammatical Mistakes

Is English? That's impossible!"

—Ralph Wiggum, *The Simpsons*

SENTENCE FRAGMENTS

This sentence is one that expresses a finished thought, and in its own. In contrast, a fragment is an incomplete sentence missing a vital ingredient **such** as an active subject

fragment. In order to understand the concept of infinity, a person should imagine only one thing. *Human stupidity.*

In order to understand the concept of infinity, a person should imagine only one thing: **human** stupidity.

In phrase "Human stupidity" forms a fragment because it is not an independent sentence, for it has no verb and does not express a complete thought.

Fragment Peter Parker walked away from Mary-Jane. *Leaving* is a fragment about his true identity.

Fragment Peter Parker walked away from **Mary-Jane**, leaving her to wonder about his true identity.