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Features

Departments

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From the President

Torch: Past, Present and Future

We all enjoy the powerful history of Torch. As a symbol of Light and Truth, Torch was founded in 1924 to encourage sharing among members of different professions in the spirit of good fellowship and mutual intellectual enrichment. In the midst of today's accelerated lifestyle, Torch is probably more valuable than ever. Advances in technology and communication have made Earth a smaller and more crowded place, while paradoxically making strangers of the people we share it with. If ever people needed to talk—and listen—it is now.

Which brings us to the challenge we currently face: How can we who understand and value Torch make sure its vital legacy continues? Life is different in 2011 from life in 1924, but people still need good fellowship, the exchange of knowledge and understanding, various disciplines brought to bear on modern problems, and high standards of ethics and well-being. In the present, Torch is adjusting for the future. Every Torch member has a role in this. You probably have some thoughts about how Torch can continue and strengthen its powerful and valuable tradition. Your Board of Directors is dedicating its Fall meeting to strategic planning for membership development. Make sure your voice is heard; I encourage you to contact your Regional Director to share your ideas for membership development. It is in the present that we can assure Torch has a strong future.

–Edward B. Latimer,
IATC President

Gold & Silver Torch Awards

At our annual convention, special Gold and Silver Torch Awards may be given to individual members for truly outstanding service, through nomination by their local clubs, submitted in advance through the Awards Chairman.

Gold Award

The Gold Torch Award honors members who have served Torch at the local, regional, and—most importantly—the International level. To qualify for this award, the nominee must have been a Torch member for at least 10 years. In any one year, the number of Gold Torch Awards may not exceed 0.1% (rounded to the nearest whole number) of the membership of the International Association of Torch Clubs (i.e., three awards for membership of 2,500 to 3,499).

Silver Award

The Silver Torch Award recognizes members who have served in an exemplary manner at the local club level. To qualify for the Silver Torch Award, the nominee must have been a member for at least 5 years. In a given year, the number of Silver Torch Awards nominees by a local club may not exceed one for each 25 members or portion thereof.

Nominations for both Gold and Silver awards should be sent by March 31, 2012 to Charles E. Carlson at IATC, 11712C Jefferson Ave #246, Newport News, VA 23606 with copies to your regional director.

Personal Transportation in the 21st Century and Beyond

The 2011 Paxton Paper

America must change its transportation infrastructure to ensure economic and social health.

By Danny J. Krebs

About the Author

Danny Krebs is retired from the NASA Goddard Space Flight Center in Greenbelt, MD, where he was a lead engineer for space flight laser and detector systems. Previously he was at McDonnell Douglas Electronic Systems Company in St. Louis, where his research led to the first all-solid-state, pulsed high power laser. He has a BS in Engineering Physics from the Colorado School of Mines, MS degrees in Engineering Management and Physics, and a PhD in Physics, all from the University of Missouri-Rolla (now Missouri University of Science and Technology). He has taught physics at Saginaw Valley State University as both Adjunct Professor and full time faculty.

Presented to the Saginaw Valley Torch Club on December 7, 2010, and as the Paxton Paper at the Torch Convention in Hagerstown, MD, on June 25, 2011.

Introduction

The original world endowment of conventional petroleum is generally estimated to be about three trillion barrels with approximately a third of that resource having already been pumped.[1] With the world consuming about 26 billion barrels of oil each year, only about seventy-five years' worth of conventional oil remains in the ground. Getting at the last trillion barrels will be a lot harder than getting the first trillion barrels, so production rates will soon decline. A recent study concluded that oil production will peak in 2014 and that by the year 2050 ninety percent of the recoverable oil on the planet will have been pumped.[2] More optimistic studies forecast a gradual global decline by 2020 or later. Many believe that oil from shale, tar sands, and heavy crude can provide additional petroleum to last well into the twenty-second century, but only at increasingly higher prices and greater environmental peril. The $440 billion in oil payments by the U.S. in 2008 was the largest transfer of wealth in human history. In 2011 we will almost certainly import more than a half-trillion dollars' worth of petroleum. U.S. imports of petroleum account for about 2.4 percent of our GDP and about one-third of our balance of payments deficit. Added to these costs, we must also consider the cost of our military posture in the Middle East. Even though the current high price levels are largely driven by speculation, increased demand from the developing world and declining supply dictate a long-term trend toward more expensive petroleum. Lastly, we have the issue of climate change and its relation to fossil fuel consumption.

Is petroleum the only energy source able to satisfy our transportation needs? In this paper, I examine how our transportation system must change to adjust to the realities of declining petroleum production, with a particular view to examining possible alternative fuels for private automobiles.

Efficiency and Fuel Options

I believe that we do not have an energy problem so much as a transportation fuel problem. While petroleum provides about 94% of our transportation energy, the total energy derived from petroleum is significantly less than the energy that we derive from coal and natural gas. The mechanical energy necessary for our transportation sector is less than half the useful energy delivered by electric utilities to customers[3]. We rely on petroleum as the least expensive way to derive liquid fuels for transportation. Liquid fuels are generally preferred for vehicles because they store energy more compactly than gaseous fuels or batteries. But gasoline internal combustion engines are far from ideal power sources for transportation. Only a fraction of the chemical energy of a given fuel can be converted to mechanical energy. That fraction has a theoretical limit called the "Carnot efficiency." The Carnot efficiency for a gasoline internal combustion engine is about 37%, but actual gasoline engines are only about 20% efficient.

When petroleum fuels are burned, we recover energy stored millions of years ago by photosynthesis of carbon dioxide from the atmosphere; i.e., we are tapping into and perturbing the world's carbon cycle. Gasoline is the primary fuel for cars and light trucks in the U.S. and diesel fuel is the primary fuel for heavy transport. Liquefied Petroleum Gas (LPG) is a mixture of propane and butane which is liquid at room temperature if compressed. It is a by-product of petroleum refining plagued by the same supply issues as other petroleum fuels. Faced with finite supplies of petroleum fuels, we must develop alternative sources of transportation energy. Despite the fact that natural gas is itself a finite resource, it deserves serious consideration as a bridge to renewable technologies using synthetic fuels (produced biologically or chemically) or electrical energy.

Natural gas, which is predominantly methane, the simplest hydrocarbon, is an excellent fuel, readily burned in internal combustion engines. Of the hydro-carbon fuels, it contributes least to global warming. The cost of natural gas is

I believe that we do not have an energy problem so much as a transportation fuel problem.

currently about half the cost per unit of energy of gasoline. World proven reserves of natural gas are roughly equivalent to a trillion barrels of petroleum with much of the proven reserves located in the Middle East and Russia. Natural gas can be liquefied for international shipment in cryogenic tanker vessels. There are terminals in the U.S. for receiving liquefied natural gas, but only about 1% of our natural gas is imported this way. Vehicles store natural gas as a compressed gas. I have personal experience of driving a natural gas car on a 300 mile round trip without having to use the gasoline backup tank. Some public figures advocate much more use of natural gas in U.S. transportation. Completely replacing the gasoline consumed in the U.S. with natural gas would cut our estimated domestic reserve of natural gas from ninety years' worth to about fifty years' worth.

Alcohols like methanol, ethanol, and butanol are also potential replacements to gasoline. Methanol has the disadvantages of lower energy content, higher volatility, and toxicity, but is more easily produced. Ethanol is the most developed non-fossil fuel. Its energy content is about 39% less than gasoline and it cannot be transported in pipelines designed for gasoline. Butanol is generally compatible with gasoline infrastructure, but is more difficult to produce than ethanol or methanol.

Hydrogen has received a great deal of attention as a potential alternative fuel. It can fuel internal combustion engines directly, or power fuel cells to make electricity for electric motors. Hydrogen can be produced from water using electricity via a process called electrolysis. When the hydrogen is burned in an engine or utilized in a fuel cell, water is produced, thereby reversing the electrolysis reaction. Because the electrolysis process is currently too costly, hydrogen is commercially produced from natural gas. Technical improvements to the electrolysis process are being developed, as are biological and solar/catalytic approaches that could also enable hydrogen production from water.[4]

All this sounds good, but there are significant problems with hydrogen. Hydrogen manufacture requires other energy sources, such as electricity, solar energy, or natural gas. Hydrogen does not liquefy at reasonable temperatures, so bulk distribution would probably need to be done in the gaseous state. Distribution is problematic due to the low volumetric energy content and high reactivity of hydrogen.[5] Despite the drawbacks, there is considerable allure to the prospect of a "hydrogen economy". Honda will lease 200 hydrogen-fuel-cell vehicles to California residents for $600 per month. Honda has also developed home refueling stations that plug into domestic natural gas lines. The Honda vehicle stores its hydrogen in 5000 psi tanks and has an advertised range of 200 miles.

Using ammonia as a fuel has attracted some supporters. Complete combustion of ammonia yields only water and nitrogen, so in principle, ammonia engines can be non-polluting. Production methods for ammonia either require methane or large inputs of electrical energy. Another problem with ammonia is its toxicity. The permissible exposure limit is thirty-five parts per million.[6] Extremely high levels of exposure can result in death. Nonetheless, one study has concluded that the risks of ammonia transport are no greater than the risks of transporting gasoline or LPG.[7]

Synthetic Fuels

Gasoline, diesel fuel, natural gas, jet fuel, ethanol, methanol, butanol, and hydrogen can all be manufactured synthetically. Chemical methods of manufacturing liquid fuels from coal have been known since the 1920s. The Fischer-Tropsch process, or similar methods, can be used to synthesize liquid fuels from coal, tar sands, or biomass. The current worldwide production capacity of synthetic fuels is about 240,000 barrels per day, which compares to the world crude oil production of about 70 million barrels per day. Germany produced up to 120,000 barrels per day of synthetic fuel during World War II. The U.S. had an active synthetic fuels program in the early 1950s with a plant in St. Louis, Missouri, producing 1.5 million gallons of synthetic gasoline from coal between 1949 and 1953. The program was de-funded by Congress in 1953, partly as a result of lobbying by the National Petroleum Council. A recent study concluded that a 50,000 barrel per day, coal-to-synthetic-diesel plant could produce a return on investment of almost 20%.[8] One drawback to these processes is that they typically consume other finite resources like coal. While the U.S. has about 250 years' worth of coal reserves at current consumption rates, conversion to a coal-based transportation system would put a strain on reserves and greatly damage efforts to limit greenhouse gas emissions.[9]

Biofuels

In a sense, biofuel technology converts solar energy into fuel using biological processes. There is enough solar energy falling on an area 40 miles by 40 miles to substitute for the energy expended by all the cars in the U.S., so it is not totally crazy to search for practical biofuel technologies. Biofuel technology has the additional advantage that it need not contribute to greenhouse gas emissions and may actually serve to reduce them. Biofuel technology can be lumped into three general approaches: (1) crop-based, which uses only the kernel from the plant; (2) cellulosic, which uses the whole plant; and (3) photo-bioreactor, which grows simple organisms in ponds or containers. The best developed biofuel is ethanol, which has reduced the Brazilian need for gasoline by an approximate factor of two. The U.S. ethanol program, which is based on ethanol production from corn, produced about 10 billion gallons in 2009, or about 2.6% of the U.S. consumption of gasoline. Although this program has many detractors,[10] it has reduced

importation of crude oil to some extent. Both the U.S. Navy and Air Force have aggressive programs to develop biofuel mixtures for jet aircraft and ships.

The technology for producing large quantities of ethanol or methanol from cellulosic materials like switch grass or wood chips is not mature. One approach involves breaking the cellulose down into glucose with mild acids, enzymes, or fungi, followed by fermentation. A company in Canada produced about 150,000 gallons of ethanol from straw using an enzyme process in 2009. Despite significant funding from the Department of Energy and private investors, a plant to synthesize ethanol from wood chips recently closed its doors without producing any ethanol.[11]

The production of liquid fuels from micro-algae has attracted some adherents, chiefly because the processes appear to be scalable. The Department of Energy estimates that the U.S. requirement for liquid fuels could be satisfied by dedicating 15,000 square miles of land to micro-algae farming, which is less than one-seventh the land currently dedicated to corn production. Unfortunately, production of fuel from micro-algae is not cost competitive. The ponds or bioreactors are difficult to keep clean and harvesting is problematic.

Electric "Fuel" Options

We now turn our attention to electricity as an alternative fuel, particularly for urban commuting. Electric motors can have efficiencies close to 90%. Therefore, the amount of energy that must be stored by a fuel cell or battery-powered vehicle is about a factor of four less than the energy that is required for an internal combustion engine vehicle. A distribution system for electrical energy already exists, and the per-mile fuel cost for electricity is about a factor of four to five times less than for gasoline. The electrical generating capability of the U.S. would not have to undergo a drastic expansion to accommodate electric cars, partly because charging can be done off-peak.

A number of types of electric vehicles are now available. Most of the power requirement in cars and light trucks comes from the need for acceleration. Driving at constant velocity on a level surface requires a surprisingly small amount of power. My Honda Civic only uses about 20 horsepower to maintain a constant speed of 70 miles per hour on level roadway. The other 120 horsepower is there for acceleration and hill climbing. Hybrids provide a way to recapture some of the energy that would otherwise be lost in braking, and apply it to the on-board battery for the next cycle of acceleration or hill climbing. Because of the power boost provided by the electric motor, the gasoline engine can be smaller than it would otherwise need to be, and smaller engines require less fuel. The Prius and some other hybrids have designs that allow the electric motors to contribute power over a wide range of vehicle speeds. Other hybrids use a simpler, but less beneficial scheme that utilizes the electric motor only at low speeds. Currently, hybrid vehicles use nickel-metal-hydride batteries, which are better developed and less expensive than lithium ion batteries.

Nevertheless, the "game changer" for electric vehicles is in fact the lithium ion battery. The weight of batteries has traditionally been a problem for electric vehicles. The EV1 built by GM and Honda in the 1990's had 1200 pounds of lead acid batteries, which was almost half the weight of the vehicle. Lead acid batteries store only 35 watt-hours per kilogram. Lithium-ion batteries achieve about 150 watt-hours per kilogram at the cell level. The GM Volt uses about 400 pounds of lithium ion batteries to achieve its 40 mile (electric only) range. Other battery technologies, such as lithium-air and lithium-sulfur are theoretically capable of storing up to 5000 watt-hours per kilogram.[12] But those batteries are in a very early stage of development. It is possible that greatly improved battery technology will be available for cars in the future.

Plug-in hybrids allow some energy to be stored in the battery from normal household plugs, or from more efficient public charging stations—the latter requiring an infrastructure change slow to come while liquid fuels are relatively cheap. After-market kits for adapting the Toyota Prius for plug-in operation are available. The Volt is an example of what GM chooses to call an extended range electric vehicle. The electric motors and the batteries are sufficiently large to support electric-only operation for a significant distance. The EPA rating for gasoline-only operation of the Volt is 37 miles per gallon. Nonetheless, owners who only occasionally take more than short trips could see an effective gas mileage of over 200 miles per gallon. The keys to success for these vehicles in the market place will be reliability and acquisition costs.

If the motor-generator system in the extended range electric vehicle is replaced with additional batteries, one then has an all-electric vehicle (EV). Tesla Motors in California has been producing a high performance all-electric sports car since 2008. That vehicle is one of the fastest accelerating production cars in the world—zero to 60 mph in 3.9 seconds. It has a range of 236 miles and costs about $101,500, mainly due to the high cost of its lithium-ion batteries. In 2011 Tesla will introduce a sedan that will cost around $50,000 and have a range of 300 miles. Nissan has introduced an all-electric vehicle called the Leaf that costs about $25,000 after a $7,500 federal subsidy is deducted from the cost. The Leaf has an advertised range of 100 miles. At this point, all-electric vehicles do not make a lot of economic sense for most people. Even hybrid owners are not likely to recoup the difference in initial cost from fuel savings. With improvements in battery performance, reductions in battery cost, and likely rises in the cost of gasoline, all-electric vehicles will soon become cost competitive for cars and light trucks.

Summary and Outlook

Synthetic fuels, biofuels, and electric vehicles could help us avoid the worst consequences of diminishing oil supplies. The availability of petroleum from tar sands and oil shale will allow us some "breathing room". Natural gas could also

provide some relief from petroleum shortfalls, but domestic supplies are finite and probably should be preserved for other uses.

The technical alternatives to petroleum fuels are all problematic, and it is not clear when or if the hoped-for breakthroughs will occur. The one thing that we can most readily do to reduce petroleum imports is conservation. Since 1980 the average horsepower of American light vehicles has doubled and the fuel economy has remained relatively constant.[13] While this is a remarkable engineering achievement, one must ask what improvements in fuel economy would have been possible if the average horsepower had not doubled. The Corporate Average Fuel Economy (CAFE) regulations enacted by Congress in 1975 were largely ineffective in improving the average fuel economy of American vehicles. Those regulations counted SUVs as light trucks and then promulgated very modest improvements for the "light truck" category. In 2007 more aggressive standards were put into place by Congress. In 2009 the Obama administration proposed even tougher CAFE standards—39 mpg and 30 mpg for cars and light trucks respectively by 2016. As much as many of us prefer large vehicles or high performance cars, our preference for those vehicles is costly, both personally and collectively. A few decades ago we were able to satisfy personal and business needs without "Super-Duty" pickups, SUVs, and "sports sedans" with 300-plus horsepower engines. There are a number of options for improving the fuel economy of gasoline driven vehicles at reasonable costs.[14]

Shifting to a hydrogen-based transportation system seems unlikely. There appear to be too many issues with hydrogen for it to be a viable fuel in the 21st century. Despite likely advances in battery technology, liquid fuels will continue to be necessary for heavy transport. The power and energy requirements for trucks and locomotives are too great to contemplate replacement with battery technology. One hopes that synthetic fuels or biofuels can eventually be available for heavy transport and air travel. Biofuels from micro-algae, genetically modified bacteria, or normal crops are attractive possibilities, but the costs will be high and the past failures in this area have been many.

With planning and foresight, civilization can survive the depletion of petroleum resources. It is up to the next few generations to manage the transition to a low-petroleum world economy. The U.S. is particularly vulnerable to disruptions in petroleum supply because of our dispersed geography, our current infrastructure, and our mindset of expecting cheap fuel to be available indefinitely. There are those who see efforts at moving the U.S. toward conservation and alternative fuels as naive or unpatriotic. They advocate more domestic production to lessen dependence on foreign sources. Increasing domestic production can lessen our dependence on foreign oil in the short term, but only exacerbates the long-term problem. Transitioning to a low-petroleum transportation sector will not be easy, but it is the only long-term solution. By doing good technical development and laying the groundwork now, we can leave an appropriate legacy for future generations.

Notes

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The Opiate of the People: Was Marx Right?

A fresh look at an old debate challenges dogmatic assumptions.

By John Fockler Jr.

About the Author

With a degree in history from Colgate, John Fockler Jr. is a "lifer" in the hotel industry, having managed properties in Ohio and Pennsylvania. His interests in history have led him to consider the role played by faith and religion in human affairs, an issue reflected in this paper. His strong interest in politics has led to two runs for the Ohio Legislature as a Libertarian Party candidate, as well as a possible bid for Congress in 2012. He currently serves the party as Secretary of the State Central Committee. Fockler is a member and past president of both the Youngstown and Akron Torch Clubs. This is his eighth paper in *Torch.*

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> *Religious distress is at the same time the expression of real distress and the protest against real distress. Religion is the sigh of the oppressed creature, the heart of a heartless world, just as it is the spirit of a spiritless situation. It is the opium of the people.*
> Karl Marx, *Critique of Hegel's Philosophy of Right,* 1843[1]

In this, one of his best-known and most often misquoted declarations, Marx compared religion's effects on people to two principal effects of opiate drugs such as opium: their analgesic effect and their intoxicating effect. Karl Marx may have arrived at a cynicism about religion at an early age. Marx's family was originally Jewish. He came from "a long line of rabbis on both sides of his family."[2] Marx's father, however, converted to Protestant Christianity, apparently so that he "could pursue his career as a lawyer in the face of Prussia's anti-Jewish laws."[3] This decision must have affected Marx's view of religion and its role in society.

What is Religion?

Religion as institution has a very long history in human society, probably about as long as that society itself. It has taken many forms. It has embraced a single, all-powerful God as well as pantheons of gods. At least one major world religion, Buddhism, is somewhat unclear about whether there is a god at all. It is sometimes claimed, usually by its opponents, that Secular Humanism is a religion. Dictionary.com lists eight definitions for the noun *religion.*[4] The first includes references to "the cause, nature and purpose of the universe." It mentions ritual and a moral code. This is the definition most of us think of first when we think of the major religions practiced in the United States and labeled as such. The sixth of the eight, however, is a much broader one: "something one believes in and follows devotedly; a point or matter of ethics or conscience."

So what are the effects of religion in human affairs? My intent here is to address this question as it applies to all religions, rather than to any specific faith. I am not, for these purposes, interested in the truth or lack of truth of any particular religion's tenets or doctrines. I intend to examine how these effects measure up to Marx's characterization of religion.

What are Opiates?

The drug Marx compared to religion, opium, is a derivative of the poppy plant. Opium itself is made from the juice of unripe seed pods. In this raw form, it was in common use for at least six thousand years before the development of several derivatives, including morphine and codeine, and the introduction of heroin, which is synthesized from morphine.[5] Opium has an analgesic effect, the relief of, or insensitivity to, pain. Morphine, the modern derivative, is still in medical use for cases of severe pain. Opium produces a feeling of calm or well-being, and in heavier doses produces narcosis, the "depressed physiological activity leading to stupor," an effect fostering its use as a recreational drug today, generally in the form of heroin. Although some derivatives of opium are not addictive, opium itself, like morphine, codeine (often used as a cough suppressant), and heroin, is highly physically addictive; repeated use produces a physical dependence on the drug. While opiates themselves do not affect judgment or cognition, their addictive nature can lead to a condition in which the need to "feed the monkey" overwhelms all other thoughts and desires.

At the time Marx wrote his famous statement, a tincture of opium in alcohol, known as laudanum, was in common use as an anesthetic and analgesic. Opium was also in common use throughout the world as a recreational drug. The quote suggests that religion offers both relief from the pain of living in what Marx saw as an unjust society and faith in an institution that produces the feeling of well-being or stupefies the common man and pacifies him so that he does not revolt against that injustice. How fair is Marx's characterization?

Religion as Analgesic

Religion—any religion—is a potent defense for the true believer against Hamlet's famous "slings and arrows of outrageous fortune." This is its analgesic effect. Most modern world religions promise that their believers will be rewarded with some kind of "afterlife" after death. Christianity and Islam tell their

faithful to expect an unearthly heaven or paradise. Hinduism promises that the good man will be reborn on earth in a higher social status, or perhaps even achieve Nirvana, "final release from the cycle of reincarnation attained by extinction of all desires and individual existence."[6] In part because of the promise of a better life to come, religious faith can be a very effective coping mechanism for people who are facing hardship or oppression.

One example of religion's role as a coping mechanism, among many that could be cited, is the role of Christianity among African-Americans in the antebellum South. The religious music that comes down to us from those days, the African-American spiritual, returns over and over again to the theme of freedom to come, if not here on Earth, then in the afterlife. "Soon ah will be don' a-wid de troubles ob de worl', Goin' home to live wid God."[7]

Some religions declare that earthly suffering is a necessary part of the process leading to salvation. Some have propounded a view that a willingness to accept suffering or even death is a special mark of grace, or God's favor. Religions like Christianity that postulate an afterworld of punishment for unbelievers and wrongdoers also offer the believer the hope for a measure of revenge, that those who have inflicted hurt will receive their comeuppance by and by. Hinduism promises that the evildoer will be reborn in lower circumstances or perhaps even in some form of animal life. All of these views serve the purpose of giving the believer the courage to face another day, no matter how hard his life may seem.

Religion's analgesic quality also involves a believer's sense of belonging to a community that offers a place to go, ritual to watch and take part in, and a means to exercise one's altruistic impulses. The believer is never alone, but receives reinforcement through being a part of a group of people that validates his or her belief structure. The individual may receive substantive support from the religious community in the form of charity, but even without such material support, just belonging to the community offers important emotional support.

Religion as Addictive

Is religion addictive? Certainly there is no physically addictive property in religion as there is in opiates. On the other hand, some in the scientific community recognize psychological addiction to certain behavior patterns such as gambling, risk-taking**,** or sexual activity that likewise have no physically addictive component. Psychological addiction is seen to result from the desire on the part of the addict to produce "a desired mood change." This would indicate that it derives from the intoxicating effect of the object of addiction.[8] Even in opiate addiction cases that join physical dependency to a psychological addiction, it seems that there is a fairly wide spread of susceptibility to addiction. How is it that heroin addiction kills many addicts who are unable to stay away from the drug even after repeated treatment, while others, such as musicians James Taylor or Ray Charles, are ultimately able to beat the addiction? Similarly, some people seem completely unable to overcome addiction to tobacco, while others find it possible to do so.

There seems to be a wide spread in susceptibility to "religious addiction" as well. Some people are completely devout believers. Religion is a central pillar to their daily lives. Other people are "Christmas-Easter" Christians, which I would equate to the "social drinker" of alcohol. Still others appear to be completely immune to religious belief. In its most severe form (and admittedly there is an element of judgment in this remark), an addiction to one's particular brand of religion can cause behavior that, at least to the observer outside the faith, looks irrational. Some of this apparently irrational behavior is fairly benign, such as a reliance on the scriptures of one's faith for a description of the origins of the universe over the findings of science. "Addiction" to religion, though, can have side effects including narrow-mindedness and extreme intolerance of people who hold beliefs which conflict with the tenets of one's own faith. In this country, such intolerance ranges from denominations that discount the beliefs of other sects whose view of the Bible is less literal than their own to small fringe religious groups that incorporate racial and religious bigotry into their teachings. In extreme cases, as we have seen, religious addiction can lead to irrational behavior such as crashing planes full of people into office buildings.

Religion as Narcotic

The devout religious believer sometimes trades his independence of thought for an unthinking adherence to the doctrines of his faith. In this regard, religion can be compared to opium in terms of its narcotic effect. Organized religion often uses sanctions to enforce strict observance of its doctrines, as shown in the practice of excommunication in the Roman Catholic Church or the institution of "shunning" which is part of Amish practice.[9] In the United States, religious believers sometimes use the mechanisms of government in an attempt to force their doctrines on others not of their faith. Attempts to ban abortion or gay marriage are examples. In theocratic societies such as those in the Moslem world that embrace *sharia*, "the law system inspired by the Koran, the Sunna, older Arabic law systems, parallel traditions, and work of Muslim scholars over the two first centuries of Islam,"[10] the state enforces absolute compliance with religious doctrine. The "narcotic" doctrine deadens the thinking process. Marx's condemnation of religion based on the pacifying effect its strict dogma tends to have on the common man poses a note of irony. Modern schools of Marxist thought have been every bit as dogmatic as the most fundamentalist religious belief and as ready to sanction non-believers as the Spanish Inquisition.

Although there are sometimes negative side effects to religious attachment, many of the most devout "religion addicts" are inspired by their faith to live lives of service to others or to society at large. At the extreme end of this spectrum are people like Mother Theresa or Albert Schweitzer. In the everyday world, these people may be the hospital volunteer, the adult literacy tutor,

the regular blood donor, or the Habitat for Humanity builder. In addiction treatment programs such as Alcoholics Anonymous, religious belief is a central part of the process of overcoming addiction. The Reverend Doctor Susan Warrener Smith, in her paper**,** "Benedict, Bernard and Bill W: The Legacy of Twelve Step Spirituality," argued that many of the twelve steps derive from historic principles in Christianity, particularly those characteristic of the monastic movement.[11] In these programs' reliance on spirituality to combat harmful addiction, it might be said they seek, in part, to replace those addictions with a benign—or even beneficial—addiction to religion. Note that these programs do not specify any particular brand of faith. It is the positive, even analgesic *quality of religion* that is being utilized here.

Promotion of a Moral Code

One characteristic of nearly all religions that is not shared in any way by opiates is their promotion of some type of moral code. The patient using morphine to combat severe pain is necessarily self-centered to the degree that that pain dominates his or her life. Presumably some other, less dangerous form of analgesic would be in use for the victim whose pain is less overwhelming. Self-centeredness reaches its peak in the addict to an opiate. The need to satisfy this addiction becomes the central feature of the addict's life, subordinating all other interests and desires.

By contrast, religious moral codes tend to be outward-focused. Observance of divine law may be the reason given for the code's tenets; some of the commandments may refer to the relationship between the worshiper and the divinity. Such laws often deal with the proper treatment of other people. Most religious moral codes enjoin believers to avoid causing unnecessary harm to others and also call upon them to do positive acts of benefit to others. "Do unto others as you would have them do unto you."

Even non-theistic philosophies almost always incorporate moral codes, sometimes implicit rather than explicit. Secular Humanists, for instance, generally embrace a code that calls for acceptance of differences in race, gender or sexual orientation, even though some of these believers are strangely intolerant of practitioners of so-called "mainstream" religious belief. That these philosophies do incorporate moral teachings is one of the stronger arguments for categorizing them as religions. These philosophies also incorporate belief structures that parallel those of so-called "mainstream" religions. Secular Humanists believe, without notable exception, in a creation narrative which includes the "Big Bang" and the evolution of living species through natural selection. That such a belief structure is supported by objective evidence which the creation myths in Genesis lack does not mean that it is any less a matter of faith. In fact, even the denial of the existence of God or gods that is the central point of any atheistic belief structure is itself a point of faith, as there is absolutely no objective evidence *for or against* the existence of a deity or deities. In place of the hope for an afterlife as a reward for correct behavior, non-theistic philosophies often substitute the ethical principle that it is desirable to leave behind a legacy of benefit to society.

Was Marx right to characterize religion as "the opium of the people?" That's for each individual to decide. I believe a good case can be made that, in large measure, he was, so long as we are careful to keep in mind the full context of the statement. He was correct in noting the parallels between the drug and religion in terms of its addictive nature, its intoxicating effects, and its capacity to alleviate suffering. Religions of any and all types, including non-theistic faiths such as Secular Humanism and several schools of Marxist theory, do indeed create patterns of dependence which parallel narcotic addiction to some degree. In the most devout believers, they can create a mindset of almost blind acceptance of doctrine which approaches intoxication. But religions also provide a relief from some of the pain of the human condition through their creation of a sense of community and the hope of some sort of reward after death. So to a fairly significant degree, for good and for ill, religion is indeed the opiate of the people.

Notes

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The Summer of 1960 and the Origin of the Laser: A Reminiscence

A physicist shares his first-hand account of the laser's birth.

By Donald F. Nelson

About the Author

Donald F. Nelson received a PhD in physics from the University of Michigan in 1959. He spent 27 years in research at Bell Labs in Murray Hill, New Jersey, with teaching interludes at the University of Michigan, University of Southern California, and Princeton University. After retirement from Bell Labs, he taught at Worcester Polytechnic Institute for ten years. In his second retirement he has written on the risk of lung cancer from residential radon exposure, on the Shakespeare authorship question, and a biography of his maternal grandfather, *To the Stars over Rough Roads*.

Presented to the Worcester Torch Club on May 13, 2010.

With the laser turning fifty years old, I would like to share my memories of its origin with you. I begin by describing the laser, whose name is an acronym for "light amplification by stimulated emission of radiation." From an operational point of view, it is a light source that produces an intense and monochromatic pencil beam. It is an optical oscillator similar to radio frequency or microwave oscillators (generators of a single frequency of electromagnetic energy) but emits a much higher frequency, ten thousand times higher, in fact. Any oscillator requires amplification to work, and for the laser the amplification arises from a microscopic process called stimulated emission. The laser can also be described, in another equally important way, as a *coherent* light source. Coherence means that the emitted light waves have regularity and order. It is the opposite of randomness. An ordinary light source, such as a tungsten filament light bulb, a fluorescent tube, or the sun, is said to be an incoherent light source because each puts out bits of light randomly in time, randomly in direction, and somewhat random in color or frequency. The light wave from a laser has the regularity of a wave on a calm lake when a single stone is tossed in, while the waves from an incoherent light source have the irregularity of the waves from rain drops falling randomly in time and place on the lake.

Lasers now enter everyday life as bar code readers at retail stores and as the writers and readers of CDs and DVDs. Medical uses include eye surgery, engineering uses include machine control and surveying, military uses include range finding and bomb directing, and scientific uses are countless. Seizing on the fact that many of these uses were unforeseen, some writer years ago coined the cute phrase, which has been often repeated, that the laser was an invention looking for a use. It may be a cute rhetorical flourish, but it has always been wrong. All of us who were trying to make a laser in 1959 were well aware that it would have multiple important uses simply because light is used in so many ways and that the coherence and intensity of a laser could improve almost all of them. Bell Telephone Laboratories, where I worked, was specifically interested in devising a laser so that it would be the coherent light wave of an optical communication system. Its much higher frequency guaranteed a hugely increased bandwidth for the transmittal of information. And that use has come about as expected through semiconductor lasers emitting into optical fibers as the transmission medium. Almost all long distant phone calls today travel part of their way by such optical means.

Early Development of the Laser

The story of the origin of the laser begins in the early 1950s when Prof. Charles H. Townes of Columbia University conceived a way of using stimulated emission to produce amplification at microwave frequencies. With two colleagues**,** he was successful and named it a *maser* for microwave amplification by stimulated emission of radiation. Later he shared a physics Nobel Prize for the attainment. Because microwaves and light are both electromagnetic waves, it was obvious that a similar procedure could, in principle, be done with light. But how to do it was the question.

At Bell Labs in Murray Hill, New Jersey, in 1959, several researchers, myself included, began studying various schemes to make a laser. Others, both here and abroad, were in the race also. Then on July 7, 1960 Hughes Research Labs announced in a press conference in New York that Theodore H. Maiman had made a pulsed laser with a pink ruby crystal. We all read the *New York Times* account the following day with great interest.[1] At a morning meeting of laser researchers at Bell Labs, opinions of the work differed sharply. The press conference had not, as usual, coincided with a scientific publication that could be studied. The only measurement mentioned in the *Times* curiously never was published in a scientific journal. The photograph accompanying the article, we learned a while later, was not the laser Maiman had used, but another under construction that the photographer thought was more photogenic!

Confusingly, a few other publications showed another device that was later identified as the actual device used. And the *Times* science reporter had carefully written only that the laser was "claimed." Confusion and uncertainty reigned. When a preprint of a paper[2] (which we later learned had been rejected at the first choice of journals) arrived a few weeks later, confusion was only multiplied. It appeared to have been very hastily written and offered ambiguous proof of laser action. The key element, the ruby crystal, was described only vaguely as "of 1-cm dimensions," hardly the expected precise description. Hand-drawn histograms were presented rather than expected instrument-recorded spectrograms. And evidence of laser action was highly technical. Neither a pencil beam nor brilliant intensity was reported.

Follow-up Experiments at Bell Labs

Our morning meeting following the press announcement of Maiman's work broke up with no decisions made and no actions recommended. I was surprised at the indecisive outcome of the meeting and immediately proposed attempting to reproduce Maiman's results. My supervisor, the late Nobel physicist Willard S. Boyle, agreed, and I began work on it that day. An experienced researcher, Robert J. Collins, joined Boyle's group a few days later wanting to work toward a laser, and Bill asked that he work with me which I agreed to. Within three weeks we were ready to test our hurriedly put-together pulsed pink ruby system. A part failed on the first test, requiring a change in the set-up. But at that moment I had to leave for Michigan where I was to participate in my sister's wedding.

Returning on Monday I found that Bob had seen evidence of laser action but felt he needed to use Arthur L. Schawlow's spectrograph to confirm it. (Incidentally, Art was later to receive a Nobel Prize in physics for nonlinear laser spectroscopy.) Without waiting for consultation with me, he had invited Art to participate. We were then a group of three. We had understood an aspect of lasers that had escaped Maiman in his first efforts: the need for the ruby to be rod-shaped (0.5 cm in diameter by 8.0 cm long) in order to concentrate the stimulated emission for light emerging from the end—a concept called mode selection. This was a key change, for it allowed us to immediately exceed oscillation threshold and so see the intense pencil beam of a laser for the first time. Further, we observed an unmistakable time dependence, called relaxation oscillations, when our laser exceeded oscillation threshold. Since Maiman had not observed them, our observation gave further confirmation that Maiman had not reached laser threshold. But our work, nonetheless, had confirmed that Maiman had made the right decisions in choosing pink ruby (which others at the time had rejected) and in his method of exciting it with a powerful helical xenon flash lamp. So he deserves the credit for originating the first laser. However, we were the first to observe the characteristic pencil beam of a laser which appears only above threshold.

Nelson with Laser Beam-Fig. 1

There is an interesting story about this first photo of the pencil beam. A local commercial photographer was hired to take the picture. Figuring that there were technical difficulties in getting the picture, I took it upon myself to call him ahead of time. The red emission from ruby is at the edge between the visible and infrared and so must be somewhat intense to see. But more importantly the typical black and white film of that era had even less sensitivity than the eye at the ruby wavelength. So I told him to use a film with an extended range of sensitivity toward the infrared. So he came and snapped his pictures, but had to call back the next day, very embarrassed, to report that there was no laser beam on his film. He had not understood a word of what I had told him! With more instruction and a return trip with the right film, he got the exhibited photo.

Letting the World Know

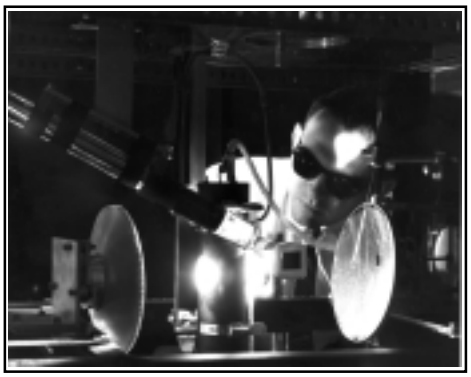
Bell Labs wished to publicize the communications possibilities of the laser. To help dramatize this, we sent ruby laser pulses during daylight from the Crawford Hill location of Bell Labs to a detector on top of a tall radar tower at the Murray Hill location, a distance of twenty-five miles. This demonstration was used as the centerpiece of our press conference held in New York in early October of 1960 and timed with the publication of our work in the premier journal *Physical Review Letters*.[3] We also demonstrated the pencil beam of the laser at the press conference, something Hughes had been unable to do. Our work along with its fine publicity was in contrast to the many confusions and uncertainties surrounding Maiman's announcement. This led some people to give us primary credit, but we never claimed priority. In fact, our press release specifically cited Maiman's priority and a later official history of Bell Labs repeated that. Nevertheless, resulting animosity and controversy about those events of the summer of 1960 have persisted for a half century. In search of a modicum of peace, I published a conciliatory article in *Physics Today*, the magazine of the American Physical Society, in January of the laser's fiftieth anniversary year.[4]

Indicative of the confusion of that summer was a conversation I had at the luncheon following our press conference. By chance I sat next to the *Time* magazine science reporter. While complimenting our presentation, he stated that since he had not believed the Hughes presentation, *Time* had not carried their story. In fact, according to Maiman's account in his book, the *Time* reporter at the Hughes

press conference had vigorously challenged Maiman's claims.[5] Imagine that! I think that incident capsulizes the confusions and uncertainties of that summer.

Further Development

In the following months I worked in collaboration with Bill Boyle to make the ruby laser operate continuously rather than just pulsed. It was a tough project, and we had to use every bit of clever optics we could conceive of, but in December 1961 we were successful. The pulsed ruby laser up to that time had been excited, that is pumped, with megawatts of flash lamp power. Our report of operating a ruby laser with just 850 watts from an arc lamp was regarded as dramatic and led the American Physical Society to arrange a press conference for us at its meeting in New York where we reported it.



Nelson with Laser-Fig. 2

Again there is a story about a photographer. Bell Labs decided to use a picture of our continuous ruby laser in its monthly magazine advertisement, so a top-notch New York commercial photographer was brought in. To make the apparatus photogenic, much of the shielding of the ultraviolet arc lamp was removed with the result that lots of the bright pump light was reflecting off things in many directions. The photographer had never had to deal with anything like that before and, surprisingly, was totally flummoxed as to how to handle it. So I took over, set up my tripod with a Linhof 4 X 5 format camera, slipped my Polaroid film back on the camera, tried various angles, determined what glaring reflections needed eliminating, taped them up with my black photographic tape (which he lacked), and with everything set I stuck my head in and he snapped the picture with his camera. He did not seem to even notice the spot on my forehead which I could not see. He received a $1,000 fee for his day's work, a handsome sum in those days, and $1,000 for each magazine it would appear in. Then AT&T decided to use it also for the monthly Bell System ad in such magazines as *Life* and *Look*, so he was awfully well paid for *my* day's work.

Stories in Later Years

There is an amusing follow-up story about this continuous ruby laser. A number of years later, the Smithsonian Institution contacted Bell Labs about obtaining parts from that experiment. The request came through the executive director of the public relations department who had an underling call me. I said that it had all been disassembled long ago, but I could give them a few of the parts including one of the trumpet-shaped ruby crystals used. Then I remembered that Bill and I had taken a Polaroid picture of ourselves with the laser late on the night the laser worked. I had an enlarged copy made and sent it to the public relations person. He called back to inform me that the executive director would not allow the photo to be released from Bell Labs because we were not wearing eye gear protective for the laser light required by a safety rule adopted many years after the experiments were done. But I should not worry, he said, they would have the glasses air brushed into the photograph by the art department! I guess I was more volatile in my youth, because that blew me over the edge. I shouted into the phone that, if the executive director was going to rewrite scientific history, he should start by painting a lead brassiere on Madame Curie in the encyclopedias to save her from dying from radiation exposure and hung up a bit chagrined at myself. But all was well. Bell Labs managers were willing to cut a little slack for their odd-ball and out-spoken researchers. The public relations person called back the next day and said the executive director had decided to release the photo as is, and then added "your lead brassiere story carried the day."

One last story: in pre-Wikipedia days when encyclopedias were printed on paper, I wrote and revised the laser article for the *Encyclopedia Americana*. When I revised it for the 1974 edition, laser physics had become even more spectacular. Laser pulses had been compressed to extraordinarily short durations while retaining their energy. Pulses a picosecond—a trillionth of a second—in duration could then be made (femtoseconds, a quadrillionth of a second, were later needed). Dividing the same energy by the shortened time gave a much increased power. Amazingly, I found that laser pulses generated with a table-top apparatus produced a light beam with an optical power exceeding the electrical power generation of the *entire* earth during that brief instant! I found that amazing and so put an exclamation point following the statement. The editor in due course told me that encyclopedias do not use exclamation points. With my volatility still intact, I told him that if he would not use it there, the exclamation point should forevermore be removed from all type boxes (using an outdated term) because there could never be a use for it in the future. I won the debate, and the laser earned the first encyclopedia exclamation point!

Notes

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3. R. J. Collins, D. F. Nelson, A. L. Schawlow, W. Bond, C. G. B. Garrett, and W. Kaiser, "Bell Labs and the Ruby Laser," *Physical Review Letters* 5 (1960): 303.

4. Donald F. Nelson, Robert J. Collins, and Wolfgang Kaiser. *Physics Today*, January 2010, p.40.

5. Theodore H. Maiman, *The Laser Odyssey*, (Fairfield, CA: Laser Press, 2001).

If Only the Neo-Cons Had Reread Their Machiavelli, Perhaps Their Wise Prince Might Not Have Invaded Iraq

America's invasion ignored the wisdom of a sixteenth-century philosopher.

By Thomas H. Hill

About the Author

An avid sailor, Tom Hill lives a simple life in retirement with his wife and two college age boys in the shadow of the Blue Ridge Mountains at the north end of the Shenandoah Valley of Virginia. After graduating in 1975 from the University of Denver where he received his BA in European history, he went to work as a reporter for a regional weekly concentrating on local land and water use issues and writing occasional features about rural life in Northern Virginia. In time, he found his way into management in retail banking and retired from the business in 2000. He now manages his family's investment partnership and serves on the board of the Hornby Charitable Trust based in London, England. His many volunteer activities include announcing at horse shows and serving as a church officer and as Secretary of the Winchester Torch Club.

Presented to the Winchester Torch Club on January 6, 2010.

- "A prince… must be indifferent to the charge of cruelty if he is to keep his subjects loyal and united."[1]
- "A man who strives after goodness in all his acts is sure to come to ruin."[2]
- "I surely think that it is better to be impetuous than to be cautious, for fortune is a woman and in order to be mastered she must be jogged and beaten."[3]

These little gems came from the quill of perhaps the world's most controversial thinker and "evil genius," Niccolo Machiavelli, in his political masterpiece of 1513, *The Prince*. For 497 years, his little twenty-six chapter book has provoked scholars and historians to write thousands of pages either bitterly attacking or mildly defending the advice Machiavelli proffered.

Most people's relationship with *The Prince* has been a quick read followed by a mid-term exam, and then a cheap resale at the college book fair. But it is a book that can be a solid foundation of one's personal lifelong library, for it remains timeless and consequential—not just because of the little snippets quoted above, but also because of the savvy advice offered to those who might conquer and rule new lands, advice that can, even now, guide today's modern princes. Unfortunately, it is too late for America's previous administration to glean anything from Machiavelli except in 20/20 hindsight. But if someone in the administration had reviewed just the first thirteen chapters of *The Prince* before invading Iraq, world events may have taken a decidedly different turn.

The Prince in Context

In his cover letter, Machiavelli wrote that *The Prince* was a "mark of my duty" toward Giuliano de Medici, who he hoped would appreciate it enough to free him from his year-long exile and welcome him back into the bosom of Florentine government. It obviously worked. Machiavelli was hired less than a month later as Florence's official historian, a position, among others, he held until his death in 1527.[4] Even today, *The Prince* is still the gift book that keeps on giving. But it's a gift only if it is read and considered before a proposed military expedition and the long-term objectives of such an adventure. To appreciate *The Prince* in the context of Iraq, one must examine the motives for sending troops in the first place, then understand the goals to be achieved, and, finally, investigate the political and cultural situation the troops would encounter once they arrived. Therefore, a brief overview of Iraq's history and political arrangements prior to Operation Iraqi Freedom is in order.

Iraq's Proud Past

Iraq is the locus of the world's oldest civilizations. The Judeo/Christian tradition claims Iraq's "Fertile Crescent" as the original dust from which God created Adam. It is the land of Babylon and Ur, Abraham's birthplace, which, by association, makes it the birthplace of three great faiths, Judaism, Christianity, and Islam. For Islam, Iraq is especially important because it is the site of Islam's split into its two major sects; the Shiites and the Sunnis. The 657 battle at Karbala in southern Iraq decided the leadership in favor of the Sunnis, who established *their* Caliphate, leaving the Shiites forever in opposition to Sunni domination. For 1,300 years, it has been an incredibly bloody schism and, during the last seven years, may have been

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responsible for tens of thousands of Shiite and Sunni deaths as each sect practiced horrific ethnic cleansings in their respective neighborhoods.

Even after being conquered by the Arab Muslims who established their Caliphate in Baghdad, Iraq remained the crossroads of conquerors including the Buyids, Mongols, and Safavids.[5] Iraq became a province of the Ottoman Empire in the sixteenth century and was finally "liberated" by the British at the beginning of World War I. From 1914, Britain held Iraq under its "mandate" until 1932 when, for the first time in over a thousand years, it became a nominally independent country under its new Hashemite King, Amir Faisal. The British remained the real owners of the oil and commerce and quartered thousands of troops there until well after World War II. Under the British, the Sunnis had been put in charge of the bureaucracy because, to the British, they seemed far more tractable and loyal than the Shiites.

Setting the Stage for Saddam Hussein's Dictatorship

In 1920, the Sunnis and Shiites somehow managed to put away their differences long enough to actually launch an unsuccessful rebellion against the British, working together to foster a nascent national unity in the name of Iraqi independence. However, the Kurds in the north were not party to this barely tentative cooperation and probably never will be. The Hashemite Kingdom, established in 1932, survived until 1958, when it was ousted in favor of a republic ruled by a brutal military dictatorship. In 1963, another coup brought the first batch of Ba'athists to power. They, too, were outmaneuvered by a rival Pan-Arab group. But, finally, in 1968, the Ba'athists, with help of their clans, families, and tribal Sheiks, once again, regained power. The final chapter was written in 1973 when Saddam Hussein became Iraq's supreme leader.

Saddam owed a great deal to his clan, the Takritis, and other tribes from Mosul, Samarra, and al-Ramadi.[6] Their powerful sheiks, acting like Iraqi dukes and barons**,** administered their region's judicial systems and tax collections for both themselves and the government in Baghdad. According to British Middle East scholar Charles Tripp, the resilience of Saddam's regime "lay in the small groups of men attached to the president by reason of common regional background, family, or tribal affiliation…. Beyond them spread the networks of patronage and association that gave them weight in Iraqi society."[7] As long as they stayed out of Saddam's way, these sheiks could run their fiefdoms as they saw fit.

Throughout its history Iraq had never seen either elective government or western style "democracy." In addition, the country was run like a medieval kingdom with Saddam providing political favors, land, and limited independence to his vassals in exchange for their loyalty and administrative help. Iraq remains a country filled with dozens of ethnic, religious, and cultural groups, clans and tribes. Within these contexts Machiavelli's *The Prince* is, indeed, a prescient oracle for anyone with territorial or political aspirations in this volatile melting pot.

Rationale for U.S. Intervention in Iraq

Operation Iraqi Freedom was the step-child of the shocking tragedy of 9/11. According to Douglas Feith, the unabashed Neo-conservative and Undersecretary of Defense for Policy in the Bush / Rumsfeld Pentagon, he and the other Bush Administration Neo-conservatives agreed that retaliation to the 9/11 attack would be "neither to secure criminal justice for the perpetrators nor to retaliate, but to prevent another attack. The United States should act in self-defense." They believed the United States should focus its attention on a "strategy for war, rather than mere law enforcement." The Neo-con**s** determined "that the enemy [is] a wide-ranging set of individuals, organizations and states" which essentially amounted to a terrorist "network" and each would have to be dealt with separately and severely.[8] This aggressive philosophy is the essence of the "Bush Doctrine" which William Kristol, fellow Neo-conservative and editor of the *Weekly Standard*, defined as a belief that "rests on the revived commitment to the principles of liberal democracy and the restoration of American military power."[9] The Administration declared that Iraq was an integral part of this terrorist network because Saddam had given money to the families of Palestinian suicide bombers. Worse, even though there was no proof, the administration claimed Saddam wanted to give or sell his weapons of mass destruction to terrorists who, in turn, would use them against the United States.

Invasion of Iraq

On the night of March 19, 2003, President George Bush announced the invasion of Iraq declaring, "Our nation enters this conflict reluctantly, yet our purpose is sure. The people of the United States and our friends and allies will not live at the mercy of an outlaw regime that threatens the peace with weapons of mass murder." Saddam's statue in Baghdad's Firdos Square was pulled down three weeks later, and three weeks after that, on the deck of the Aircraft Carrier *Abraham Lincoln*, Bush announced that major combat operations were at an end. Now began the arduous task of installing a democracy in a foreign land with cultures and people the United States didn't truly understand, a country that had been ruled by dictators, kings, and foreign overseers since Hammurabi. If

President Bush had read *The Prince*, he would have come across this passage which might have given him pause: "It must be realized that there is nothing more difficult to plan, more uncertain of success, or more dangerous to manage than the establishment of a new order of government; for he who introduces it makes enemies of all those who derived advantage from the old order and finds but lukewarm defenders among those who stand to gain from the new one. Such a lukewarm attitude grows partly out of fear of the adversaries, and partly from the incredulity of men in general who actually have no faith in new things until they have been proved by experience."[10] This one passage encapsulates the entire challenge that continues to this day.

Within weeks, the insurgency exploded, ethnic violence ravaged neighborhoods, and the economy fell into ruins. America wondered what went wrong and why these people hated us so, unaware of Machiavelli's advice: "When one acquires states in a province where the language, the customs, and the laws are different, there are difficulties; here, both fortune and great ability, are needed to keep them…. One of the best and most ready solutions is for the new ruler to reside there…. Being on the spot, one may observe disorders as they arise and quell them quickly; not being present, one will learn about them only when they have assumed such proportions that they cannot be quelled."[11] It is doubtful the Bush Administration considered colonization, but Machiavelli adds yet another prescient observation: "By maintaining soldiers instead of colonies, a prince will spend much more, since he will have to use the entire revenue of the state to protect it. Thus the acquisition will become a loss."[12]

A Costly War

The Iraq war has been enormously expensive with some analysts estimating it will cost well over $600 billion. In addition, some Congressional "budget hawks" have speculated that the expense may even threaten America's financial stability which could, in turn, threaten the country's security, both economically and militarily. If this happens, the endeavor will have to be considered a gigantic loss.

Machiavelli was not unique in warning about the price of keeping paid armies in occupied territories to quell violence and rebellions. Chinese General Sun Tzu, some 2,000 years earlier, also spoke of the costs of war. In his seminal treatise *The Art of War*, Sun Tzu counseled, "If the campaign is protracted, the resources of the state will not be equal to the strain," adding, "There is no instance of a country having benefited from a prolonged warfare." As a result, he concluded, "Poverty of the state exchequer causes an army to be maintained by contributions from a distance. Contributing to maintain an army at a distance causes the people (at home) to be impoverished."[13] The Bush administration did not include the war in the annual budget. Money to conduct the war was, and still is, raised by selling treasury bonds, mostly—and quite ironically—to the Chinese. Before the Iraq war Donald Rumsfeld confidently told the American public that the cost would be no more than $60 Billion, with any additional expenses funded by Iraqi oil revenues. That didn't happen and the cost of this "distant war" has continued to rely upon "contributions from a distance" (i.e., the American taxpayers).

Machiavelli further admonishes princes that keeping troops "is also more harmful because it annoys the entire state as the troops are moved from one lodging to another. Everyone will feel the disruption and becomes an enemy—an enemy who can be troublesome because, though beaten, he is ever at home. From every point of view, therefore, this kind of protection is just as useless as colonies are useful."[14] There is not, and never has been, a plan to save money by colonizing Iraq. Therefore, according to both Machiavelli and Sun Tzu, the only implied outcome will be America's financial implosion.

Problems Caused by the Invasion

After the coalition's invasion, Iraq's fragile infrastructure fell into even worse disrepair. In this regard, Machiavelli gives further warning about the medieval dukes and barons, similar to the tribal sheiks, somewhat autonomous but fearfully subservient and loyal to their king, Saddam Hussein. When dealing with these baron/sheiks, he warns that a prince who is "unable either to please them or to annihilate them…will lose the state at the first likely opportunity."[15] When the Provisional Authority overseen by Paul Bremer and the Interim Iraqi Government, dominated by the Shiites, could not provide even the basics of electricity, road repair, sewage treatment, and most importantly, security, the Sunni Sheiks took things into their own hands so to defend themselves from both foreign and Shiite domination, joining forces with a few hundred foreign al Qaeda fighters in an attempt to carve out their own regional power base. The insurgency only ended when General David Petraeus saw the wisdom of trying to "please them" with money and a certain amount of local autonomy. Unfortunately, the money is quickly running out and American troops are set to come home in the next year. When the Americans withdraw, will the sheiks again resort to violence out of frustration and anger, and thus threaten the delicate national unity and the already weak central government? Many experts are convinced that only time will tell, and that Iraq will probably experience even more violence before its geopolitical identity is finally determined.

Although it appears hopelessly divided, Iraq does have a sense of national identity. Oddly, Saddam Hussein gave it a huge boost by characterizing all of Iraq's neighbors, especially Iran, Kuwait, and Syria, as a collective common enemy. Thus even though Iraq's population suffered greatly under Saddam, they never wished to be ruled by yet another foreign power. From its 1932 independence through the Saddam regime, Iraq had finally become Iraq;

an independent country with a national pride and sense of self. Of course, Machiavelli voices a warning to any army looking to invade such a country: "Anyone who becomes master of a city accustomed to freedom (meaning freedom from foreign domination) and does not destroy it may expect to be destroyed by it; for such a city may always justify rebellion in the name of liberty and its ancient institutions."[16]

Invasion Goal: Regime Change

The invasion's goal was to install a government that would be a beacon of democracy in the Middle East and a friend of the United States and its ally, Israel. Unfortunately, the Nouri Al Maliki government, elected in 2005, has never been considered truly legitimate and the Iraqi Army cannot yet be relied upon to protect this shaky government. That effectively leaves the United States military propping up the regime. This has led to huge resentment against a "prince" who relies on mercenaries to keep him in power, which Machiavelli deems as "useless and dangerous; …any ruler who keeps his state dependent upon mercenaries will never have real peace or security…. [Troops] supplied by a foreign power…may be useful and trustworthy in pursuit of their own interests, but they are almost always disastrous to the one who borrows them; for if they are defeated, he is ruined, and if they are victorious, he becomes their prisoner."[17] What will happen to the Iraqi government after U.S. troops depart? Is the Iraqi army up to the challenge? Will their government, considered the fourth most corrupt in the world, be worth fighting and dying for?[18] What if the next government turns against the United States and becomes belligerent to its neighbors? The future is very uncertain, and in many ways, more frightening than the past.

All these Warnings…Ignored. Why?

It is doubtful Neo-conservatives would consider any Machiavellian advice meritorious. In fact, Neo-conservative leaders have consistently condemned him. Irving Kristol, considered the "father of Neo-conservatism," accuses Machiavelli of being a purveyor of dangerous Nihilism. The late Leo Strauss, the Neo-conservative philosopher and professor at the University of Chicago, roundly criticized Machiavelli saying: "If it is true that only an evil man will stoop to teach maxims of public and private gangsterism, we are forced to say that Machiavelli was an evil man."[19] Conservative commentator George Will once said that if Machiavelli were exposed, warts and all, there would just be warts. So it is doubtful any Neo-conservative in the Bush White House dusted off his copy of *The Prince* before launching Operation Iraqi Freedom**.**

The United States is in a noble effort to make the world safe from terrorist attacks. But winning this war may prove far more difficult than ever imagined. In the "War on Terror" whom do we attack? Iran may be on its way to acquiring nuclear weapons and already provides financial support to Hezbollah**,** which the United States has designated a Syrian and Lebanese terrorist organization. Pakistan already has nuclear weapons and has supported the Taliban. North Korea may have supplied nuclear technology to both the Syrians and Iranians. If the Bush Doctrine is invoked, could each of these countries be a candidate for forcible regime change?

Yale historian Edmund S. Morgan recently wrote in *Smithsonian Magazine*, "Only idiots escape entirely from the world that the past bequeaths."[20] No matter what one thinks about Machiavelli, Sun Tzu, Plato, Aristotle, Thucydides, or even Heidegger, they have bequeathed wisdom even if their messages aren't always palatable. It is easy to find fault with Machiavelli, but if those who made the critical decisions about invading Iraq had read just the first few chapters of *The Prince*, perhaps they might have chosen a different course for both the war and the world.

Notes

1. Niccolo Machiavelli, *The Prince*, trans. and ed. Daniel Donno (New York: Bantam Classics, 1966), 65.

2. *Ibid*, 62.

3. *Ibid.*, 94.

4. Quentin Skinner, *Machiavelli: A Very Short Introduction* (New York: Oxford University Press, 1990).

5. Albert Hourani, *A History of the Arab Peoples* (New York: Warner Books, 1992), 215.

6. Charles Tripp, *A History of Iraq*, 2nd ed. (Cambridge, UK: Cambridge University Press, 2000), 200.

7. *Ibid.*, 264.

8. Douglas Feith, *War and Decision: Inside the Pentagon at the Dawn of the **War** on Terrorism* (New York: Harper, 2008), 6.

9. Senate Committee on Foreign Relations, compiled testimony, *What's Next in the War on Terrorism?* 107th Cong., 2nd Sess., February 14, 2002, http://bulk.resource.org/gpo.gov/prints/107/s_77688.txt [accessed September 2, 2011].

10. Machiavelli, 31 .

11. *Ibid.*, 19.

12. *Ibid.*, 20.

13. Sun Tzu, *The Art of War*, tr. Lionel Giles (1910; repr., suntzusaid.com), ch.2, passages 3, 6, and 10, pages 6-7, http://www.suntsusaid.com/artofwar.pdf [accessed September 2, 2011].

14. Machiavelli, 21.

15. *Ibid.*, 25.

16. *Ibid.*, 32

17. *Ibid.*, 56.

18. Iraq ranked 176 out of 180 countries in the Corruption Perception Index for 2009, based on surveys by Transparency International, http://www.trans-parency.org/policy_research/surveys_indices/cpi/2009/cpi_2009_table [accessed September 2, 2011].

19. Leo Strauss, *Thoughts on Machiavelli* (Chicago: University of Chicago Press, 1978), 9.

20. Edmund S. Morgan, "A World Too New," *Smithsonian Magazine* (October 2009).

Whistling in the Dark: "Brother Alien, Where Are You?"

A scientist takes a close look at man's ongoing quest for the elusive messenger from outer space.

By Ernst Behrens

About the Author

Ernst Behrens earned his PhD degree in physics in 1961 from the University of Göttingen in Germany. After a fellowship at the Nuclear Research Center in Grenoble, France, he went to work with the Siemens Corporation in Erlangen, Germany, as a nuclear reactor physicist. He came to the U.S. in 1966 as a materials scientist, first working with the Lockheed-Georgia Company and then in 1969 with Armstrong World Industries in Lancaster, Pennsylvania, where he became a group leader and later a Research Fellow. He retired in 1994, pursuing an interest in astronomy and cosmology ever since.

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Messengers from Above

We all know that "whistling in the dark" has a therapeutic effect to overcome loneliness. Man's precarious situation on this planet has given rise to the question: "Are we alone?" along with the hope that the answer should be "No" and that somebody "out there" could bail us out. Not surprisingly, the desire and call for outside help has also found its way into religious rituals. A text in the Catholic liturgy petitions God to send His angel from heaven, "to guard, cherish, protect, visit, and defend all that are assembled in this place."[1]

Nowadays these thoughts tend to be expressed in a more secular way but their substance has changed little. The idea of a savior from outer space has even acquired literary status because it strikes a sensitive chord in many people, especially when the messenger is a cute little fellow like Saint-Exupéry's *Little Prince* or Spielberg's *E.T.* I also remember my math professor during the height of the **C**old **W**ar when I lived only a few miles west of the Iron Curtain. He had fled from Latvia and was very afraid of the Russian communists. When prompted, he would talk about the "Venusians" who he said are circling the Earth in their spaceships and watching us. Apparently, they served as his guardian angels, because he was convinced they would intervene to save us from self-destruction should World War III break out. Unfortunately, the good professor had made a fatal mistake by picking the planet Venus as the home base for his aliens, because within a few years his belief became untenable. Others were more cautious in making similar pronouncements that are not as easily disproved, so they could always justify "more research" (and government funding) to find aliens. After all, "absence of evidence is not evidence of absence." I will not be talking about science-fiction entertainers or UFO hunters, but about established scientists who for one reason or another are straying into this borderline field between science and myth. As the historian George Basalla says in his critical overview: "Religious elements continue to adhere to the perception of extraterrestrial life even as we study it in the twenty-first century."[2]

Aliens in History

At the dawn of modern science in the sixteenth and seventeenth centuries, we encounter the famous trio of Copernicus, Galileo, and Kepler cautiously emancipating their worldview from the prevailing political correctness. Galileo's descriptions of mountains and valleys on the Moon were heretical in themselves, so he did not go any further with public speculation about its possible inhabitants. He was, of course, keenly aware of the burning at the stake of Giordano Bruno, who had argued in his 1584 publication *De l'Infinito, Universo e Mondi* that living things inhabit innumerable earths revolving around other suns. The protestant Kepler, on the other hand, did not feel as restrained as his Italian friend and colleague. He wrote about a "dream" he had of a trip to the Moon where he encountered human-like creatures who had constructed underground caves as protection against the heat and cold. He too had to be careful not to provoke his Aristotelian colleagues, especially since his mother had been accused of witchcraft. Publication of his manuscript *Somnium* was therefore delayed until after his death. Today it is valued not so much for its scientific content but as the first modern science-fiction novel, one that inspired Jules Verne, Herbert George Wells, and others.

In addition to Kepler's "dream," other seventeenth and eighteenth century speculations about life on the Moon have survived. In his 1638 book, *The Discovery of a World in the Moone*, the Anglican bishop John Wilkins, founder of the Royal Society of London, expressed hope that lunar dwellers would develop into future trading partners with England. The entertaining *Entretiens sur la Pluralité des Mondes*, published in 1728 by the secretary of the French Academy of Science, Bernard le Bovier de Fontenelle, and translated into many European languages, describes a philosopher teaching a charming and intelligent Marquise about life in the cosmos. When the teacher cites the superior technology of people on the Moon, his student wonders why they have not yet arrived on Earth, thereby anticipating by over two hundred years the famous paradox

...we should carry out the necessary introspect and examine more critically our emotions and collective imaginations, rather than whistling in the dark and expecting to be saved by messengers from the stars.

formulated in 1950 by physicist Enrico Fermi: "Where are they?"[3]

After it became evident that nobody could live on the Moon, the next-best candidate for alien residence was the planet Mars. The most outspoken champions of this idea in the late nineteenth and early twentieth century were Giovanni Schiaparelli, the director of the Brera Observatory in Milan, and Percival Lowell, a wealthy amateur astronomer from Boston. Schiaparelli's educational background in hydraulic engineering gave him an expertise in the flow of fluids and associated structures. The Suez Canal, hailed as the greatest civil engineering achievement ever, had just opened when he observed numerous "canali" on the Martian surface, which he interpreted as giant irrigation systems constructed by a technologically superior civilization. His elaborate maps of canal networks generated widespread attention and controversy.

Lowell picked up where Schiaparelli had left off. Before he built his own observatory in Flagstaff, Arizona, to study Mars, he made sensational claims to the Boston Scientific Society about the Martian canals as the work of intelligent beings. He announced his "discoveries" to newspapers and popular magazines while lecturing to large audiences eager to hear about intelligent Martians. During his first year at Flagstaff, he and his team recorded 183 canals of which Schiaparelli had already charted 67. However, an increasing number of astronomers suspected that the dark lines Lowell saw were optical illusions. They accused him of bringing preconceived ideas to his work and of stubbornly refusing to acknowledge any evidence to the contrary. He nevertheless clung to his theory until his death in 1916.

Modern Aliens

When on September 16, 1932, Karl Jansky of the Bell Telephone Company identified radio waves coming from beyond the solar system, another window opened in the search for alien civilizations.[4] Not only did a new vehicle of communication with aliens become available, but the discovery also extended the range of sending and receiving messages over distances hitherto inaccessible. After a delay caused by the Second World War, the first scientific proposal to open radio communications with possible aliens appeared in 1959 by two physicists at Cornell University, Guiseppe Cocconi and Philip Morrison.[5] The following year, astronomer Frank Drake, working on "Project Ozma," aimed the eighty-five-foot diameter radio telescope of the National Radio Astronomy Observatory in Green Bank, West Virginia, at two nearby stars.[6] He recorded a strong signal that eventually turned out to be interference from aircraft. One of the stars, Epsilon Eridani, is only 0.5 to 1 billion years old,[7] and the other star, Tau Ceti, is surrounded by a disk of debris ten times more than the Sun's.[8] In either case, intelligent life is unlikely to have evolved.

Jansky's discovery made mankind the youngest communicative galactic civilization. Older members of the club, if they exist, must be technologically more advanced. According to Frank Tipler of Tulane University, they must have developed superior propulsion systems and robotics necessary for space travel.[9] That would give them the capability to visit planets of other stars and eventually to colonize our entire galaxy. Since we don't see any evidence of that, Tipler concludes, they don't exist. The same reasoning must have gone through Fermi's mind, when he asked his ironic question in 1950 without elaborating.

Frank Drake is best known for the equation that bears his name. He presented it in November 1961 to the Green Bank conference of the Space Science Board of the National Academy of Science.[10] It is a simple product of seven factors that provides a framework for discussing the likelihood of finding other advanced communicative civilizations in our galaxy. The equation is based on estimates of probabilities regarding the conditions for the existence of life elsewhere in the universe.[11] It is important to understand, however, that it carries no relevance to our own existence. Our existence cannot be made the subject of a statistical estimate, because it is certain. A simple example will make this clear. Suppose I want to estimate the number of people in this room who have their birthday this month. Not knowing anything about anyone's birthday, except my own, the best I can do is to assign a probability of 1/12 to everyone, *except to myself*, and multiply it with the number of people in this room, *excluding myself*. The product represents my best estimate for the number of people in this room, *other than me*, whose birthday is this month. In addition, I know for sure that my own birthday also happens to be this month, so I must *add* one to the product. This point is often overlooked in discussions when it is claimed that the product from Drake's equation must be at least 1, "because we exist." In fact, values between 10^{-5} and 10^{7} have been quoted, depending on how the person performing the calculation feels about other advanced civilizations in our galaxy.[12] The variability can be explained by representing the number of communicative civilizations as the product of the number of stars (very large) with the probability of a communicative civilization existing on a planet near a star (very small). The values of such products ("infinity times zero") are typically ambiguous. Optimists emphasize the first factor and obtain a large product, whereas pessimists place more emphasis on the second factor and end up with a small product.

Like the factors in Drake's equation, all discussions about alien life suffer from a notorious lack of observational data, not unlike scholastic disputations that depend

essentially on logical deductions from first principles. Of course, the results are only as good as the underlying assumptions or, to use a respectless modern expression, "garbage in—garbage out." One of these questionable premises is the principle of mediocrity, rooted in the Copernican revolution, which states that our sun, our planet, and our species are just average entities in the universe and nothing special.[13] Hence, there must be millions of others like us. However, considering the highly selective physical and biological conditions for intelligent and communicative life to develop on a habitable planet near a sunlike star, another principle called the "rare earth hypothesis" was developed that states the exact opposite.[14] Referring to the unrestrained speculations in 1971 during an international conference in the Soviet Union, when communication with extraterrestrial intelligence received the official acronym CETI, the historian William H. McNeil remarked "I feel I detect what might be called a pseudo or scientific religion."[15]

In November 1974, Frank Drake used the 1000-foot-diameter radio telescope in Arecibo, Puerto Rico, to send a coded message to about 300,000 stars in the great globular cluster of the constellation Hercules, some 25,000 light years away. Of course, the answer, if any, cannot be expected to arrive here on Earth before the year 52,000 AD! Cosmic optimists like Drake are not deterred by such minor problems, because he thinks that immortality "rather than rare, may well be very common" and that "it seems entirely reasonable to expect that in the biological realm time will bring us immortality, just as surely as it brought us a cure for poliomyelitis."[16] Regrettably, like my old math professor, he stuck out his neck too far when he published a prediction in 1992 of "the imminent detection of signals from an extraterrestrial civilization."[17] He declared: "This discovery, which I fully expect to witness before the year 2000, will profoundly change the world." The only event that had come remotely close to Drake's expectation was the so-called

Fortunately, the space agency is no longer wasting its time, talent, and money to hunt down imaginary aliens but is concentrating on the more promising goal of finding any form of life within and outside the solar system.

"Wow!-signal" that Jerry Ehman had picked up in 1977 by the Big Ear radio telescope of Ohio State University.[18] It had lasted 72 seconds and caught Ehman's attention due to an unusually high signal-to-noise ratio. Despite numerous attempts to detect it again, it never repeated itself.

The most eloquent twentieth-century advocate for the existence of other advanced civilizations in the cosmos was Carl Sagan. He had made important contributions to planetary science early in his career, notably on the strong greenhouse effect of Venus that renders the planet uninhabitable. Before becoming a full professor at Cornell University, he coauthored with Soviet astrophysicist Iosif Shklovskii in 1966 a book entitled *Intelligent Life in the Universe*. Shklovskii had calculated in 1959 that the Martian moon Phobos has an apparent density of only 0.001 g/cm^3. He explained this strange result by suggesting (two years after Sputnik) that Phobos may be an artificial hollow satellite constructed and launched by an ancient Martian civilization. In their book the authors mention the possibility to find "fossils, footprints, and minarets" on Mars. They also conclude that our galaxy is populated by many technologically advanced civilizations, anywhere between fifty thousand and one million, with an average lifetime of ten thousand years.[19]

Two space probes in 1972 and 1973, Pioneer 10 and 11, became the first man-made objects to leave the solar system. Carl Sagan was instrumental in convincing NASA to attach a gold-plated plaque to the spaceships with a message to inhabitants of extraterrestrial worlds telling them about our solar system and about ourselves. When Voyager 1 and 2 were launched in 1977, they contained more extensive messages carrying text, pictures and sounds from Earth that were recorded on a gold-coated LP record. Since nobody in his right mind could expect these messages to ever be found and interpreted by an intelligent alien, it becomes obvious at this point that Sagan's intended audience was much closer to home. One of Sagan's principal motivations for engaging in such populist activities appears to be a genuine concern for peace at a time when the threat of nuclear war was quite real. In his 1977 novel *The Dragons of Eden* that earned him the Pulitzer price the following year, Sagan almost desperately conjures the receipt of a message from outer space that "will show that there *are* advanced civilizations, that there *are* methods of avoiding the self-destruction that seems so real a danger of our present technological adolescence."[20] According to his biographer Keay Davidson, Sagan once remarked, "More effort up there, less chance of fighting down here."[21] In his book and popular TV Series *Cosmos*, Sagan talks about a wealth of useful information contained in intergalactic radio transmissions that he called an "Encyclopedia Galactica,"[22] a term Isaac Asimov had invented earlier in a different context.[23] Many scientists felt uneasy about Sagan's showmanship and his self-promotion in the media. George Basalla called him "Lowell's successor." As a result, he was denied membership in the American National Academy of Science.[24]

Drake's Arecibo message in 1974 stirred some controversy among scientists, not so much because its overall value was questioned but because some were afraid that it might induce hostile aliens to invade the Earth. By now NASA had become interested in the activity, but to play it safe, it chose to concentrate on searching for, instead of communicating with, aliens. The new acronym, therefore, was SETI instead of CETI. Its activities were government-supported until 1993, but always remained controversial among members of Congress. Their strongest

opponent was Senator William Proxmire of Wisconsin who awarded NASA the 1979 "Golden Fleece Award" for wasteful and foolish spending of taxpayers' money. He argued against "chasing interstellar communications instead of improving communications on Earth." In order to avoid the perception of "hunting for little green Martians," the program was renamed "High Resolution Microwave Survey" (HRMS) in 1992, but criticism continued nevertheless. Ernst Mayr, a well-known evolutionary biologist at Harvard, called the NASA search "highly dubious and an extravagant expenditure of money in times of appalling federal debt." He said that the problem is biological and sociological rather than physical, because among 50 billion species that had lived on Earth, only one had generated civilized life.[25]

Ever since SETI fell in disgrace with Congress and was no longer supported by public funds, NASA kept a low profile in its search for intelligent aliens. Instead, it is now pursuing a more general program in astrobiology—content with finding any form of life, however primitive. In the meantime, private sponsors are still holding out for that elusive intelligent signal from outer space that they hope will assure them a place in the history books. In October 2007, the Allen Telescope Array (ATA) in Hat Creek, California, consisting of forty-two radio telescopes, started collecting radio signals from the far reaches of the universe.[26] It is operated by the University of California at Berkeley with seed money from Microsoft cofounder Paul Allen. A network of 350 radio telescopes was planned for completion in 2010 but has not yet attracted sufficient funding.[27]

Conclusion

Fortunately, the space agency is no longer wasting its time, talent, and money to hunt down imaginary aliens but is concentrating on the more promising goal of finding any form of life within and outside the solar system. After centuries of fruitless search for superior alien intelligence, a more "down-to-the-earth" understanding of our cosmic identity is needed. Wishful thinking and archetypical fantasies are possible by-products of a survival instinct and seem to have played a major role even in scientific investigations. Therefore, when it comes to answering Fermi's question "Where are they?" we should carry out the necessary introspect and examine more critically our emotions and collective imaginations, rather than whistling in the dark and expecting to be saved by messengers from the stars.

Notes

1. Part of the Asperges ritual (sprinkling with holy water).

2. George Basalla, *Civilized Life in the Universe*, (New York, Oxford University Press, 2006), 12. This excellent reference book was used extensively for the historical facts quoted in the article.

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4. *New York Times*, May 5, 1933.

5. Guiseppe Cocconi and Philip Morrison, "Searching for Interstellar Communications," *Nature* 184 (September 19, 1959): 844-846.

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12. Michael A. Seeds, *Foundations of Astronomy*, 4th ed. (Belmont, CA: Wadsworth, 1997), 596.

13. Iosif S. Shklovskii and Carl Sagan, *Intelligent Life in the Universe* (New York: Dell, 1966), 356-61.

14. http://en.wikipedia.org/wiki/Rare_Earth_hypothesis [accessed August 3, 2011].

15. Basalla, 155.

16. Frank D. Drake, "A Speculation on the Influence of Biological Immortality on SETI," issue 7, *North American AstroPhysical Observatory, Cosmic Search* 2/3 (Summer 1980), 9.

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18. http://en.wikipedia.org/wiki/Wow!_signal [accessed August 1, 2010].

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20. Carl Sagan, *The Dragons of Eden* (New York: Random House, 1977), 234.

21. Keay Davidson, *Carl Sagan: A Life* (New York: Wiley, 1999), 100.

22. Carl Sagan, *Cosmos* (New York: Random House, 1980), ch.12, 292-315.

23. http://en.wikipedia.org/wiki/Encyclopedia_Galactica [accessed August 1, 2010].

24. Davidson, 389-92.

25. Ernst Mayr, "The Search for Extraterrestrial Intelligence," *Science* 259 (March 12, 1993), 1522-23.

26. http://en.wikipedia.org/wiki/Allen_Telescope_Array [accessed April 1, 2010].

27. Christopher Chyba, "The New Search for Life in the Universe," *Astronomy* 38, no.5 (May 2010), 34-39.

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The Glassmakers, Revisited: The Beginning of Owens-Illinois, 1888-1930

A small-town enterprise spawns a classic tale of the global impact of American ingenuity.

By Jack K. Paquette

About the Authors

Jack K. Paquette, a native of Toledo, Ohio, earned a Bachelor of Arts in journalism and a Master of Arts in political science from The Ohio State University following World War II naval service in the Pacific Theater of Operations. While attending OSU, he worked as copy editor and assistant city editor of the morning daily newspaper in Columbus. He joined the Owens-Illinois Glass Company in 1951 as a creative writing specialist and was vice president and assistant to the chief executive officer of that company when he retired 33 years later to form Paquette Enterprises, a management consulting, retailing, and publishing company. He has written four books on the history of America's glass industry, as well as a widely-acclaimed memoir titled *A Boy's Journey through the Great Depression*. Jack and his wife of sixty-four years, Jane, reside in Toledo, where he recently served as Torch Club president.

Presented to the Toledo Torch Club on September 20, 2010.

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The venerable Toledo-area Owens-Illinois glass company is the world's largest manufacturer of glass bottles and jars for food, beverages, and medicines. Tracing its ancestry to the New England Glass Company in East Cambridge, Massachusetts, in 1818, today's modern enterprise grew from the genius of Michael J. Owens, inventor of a revolutionary machine to blow bottles automatically; the business acumen of his boss, Edward D. Libbey; and the subsequent entrepreneurial spirit of William E. Levis.

A Factory Goes West

The early evening of August 17, 1888, was an occasion to remember in Toledo, Ohio. Workers from the New England Glass Company factory in East Cambridge, Massachusetts, had just arrived by train, eager to begin blowing glass in a new facility erected for them in the city's "Lower Town."[1] Nothing like this invasion of skilled workers from afar had ever happened before in the bustling industrial city on the Maumee River. Not even the week-long celebration heralding the availability of natural gas in the area—held just eleven months earlier—equaled the festivities of that spectacular August evening. Mayor John Hamilton and thousands of townspeople welcomed the workers and their families, and a local band was on hand to blare out marching music as it began escorting the Easterners from Toledo's Union Station to a picnic site on the grounds of the new glass factory, four miles away. The mayor and Edward Drummond Libbey, the East Coast company's president, paraded together in an open carriage through Toledo's downtown, then out Summit Street to the new factory and an evening of fun, food, and fireworks.

The credit for bringing Ed Libbey's nationally-known company to Toledo belonged to local hardware merchant William H. Maher, secretary of the Toledo Businessmen's Committee, who had put together the Libbey firm's relocation package and raised the $4,000 to pay for it. That package was one of several dozen Maher had developed in the late 1880s to lure manufacturers to Toledo in the wake of the discovery of natural gas in northwestern Ohio. Under the New England Glass deal, Libbey's company would be given a four-acre building site and fifty lots on which to build houses for workers, *if* the East Coast entrepreneur would construct a new factory on the property and relocate his operations there. Maher pointed out to the business committee that any town in the Midwest would be more than happy to pay whatever it would cost to get Libbey's factory. "And here it is," he said, "just like a large ripe cherry about to drop into the mouth of Toledo."[2] There was no question in anyone's mind that getting a well-known company like New England Glass to move to Toledo would be a major coup for the city. After all, that venerable company, reported to be the largest glass works in the world, had been blowing fine glass tableware since its founding in 1818. Faced with the increasing cost of labor and fuel on the highly-industrialized East Coast, the factory had been forced to shut down in 1877 and had been sold the following year to former general manager William L. Libbey and his son, re-branded as "the New England Glass Company, W.L. Libbey and Son, Proprietors." But changing the name didn't help the new owners to prosper. By the time the younger Libbey took over after his father's death in 1883, the company was in serious financial trouble. Faced with labor strife, high energy costs, and an annual deficit of $40,000, Ed Libbey began seeking a new plant site in the Midwest where industry was being welcomed with open arms. Tempted by offers ranging from $25,000 to $50,000,

plus free land and free gas, from other Ohio gas boom towns such as Tiffin, Findlay, and Fostoria, Libbey ultimately chose Toledo because his well-paid workers were more likely to make the move where they were "able to afford luxuries not available in those small towns."[3] However, equally as important as Toledo's life style to Libbey—a pragmatic businessman—were the city's excellent rail and water transportation systems, its proximity to nearby Sylvania's high quality silica sand deposits, its large labor pool, and its sophisticated financial and legal talent, not available in the smaller cities in that part of Ohio.

Challenges for the Start-up Company

Ed Libbey's newly-designed facility was completed and the first production began on August 22, 1888, just five days after the final group of workers arrived from Boston; meanwhile, the company's name had dropped the "New England" part to become simply "W. L. Libbey & Son." The start-up of the new factory was extremely successful due to the expertise of the veteran workers and managers the 34-year-old Libbey had brought with him from the East Coast. However, all was not well in the new glasshouse. Its new furnace was defective, production speeds and quality levels were far below the old factory's standards, and many of the transplanted workers disliked living in the Midwest, leaving their jobs to return to the more cosmopolitan Boston area. Libbey's search for replacement workers brought him to Wheeling, WV, in the fall of 1888, where he hired a rough, tough, young, inventive glass-blower named Michael J. Owens. Although only 29, Owens was a veteran of the glass business, having started in the glasshouse as a 10-year-old glory hole boy before becoming a journeyman glassblower at age 15. Already an expert in the business, he was immediately aware that major changes had to be made at the Libbey plant to keep it from having to shut down. And he lost no time in telling his new boss what needed to be done…and that he was the man to do it! He immediately accepted Libbey's offer of a foreman's position. That offer and Owens' quick acceptance would be among the best business decisions either man would make—not because the young Irishman was an especially good leader, but because this promotion, and a later one to plant superintendent, positioned him where he eventually could put his mechanical genius to work for the company. Libbey and Owens would stay extremely close for the next thirty-five years, building a glassmaking empire that survives to this day.

They were an unlikely pair. Libbey was an urbane, well-educated gentleman from Boston, who had known since childhood that he was destined to run his family's glassmaking business. Owens, the unschooled son of an immigrant coal miner, had from childhood faced a future that surely would begin and end on a factory production line or in the bowels of a West Virginia coal mine. Libbey was soft-spoken and sweet-tempered, totally at ease in the parlors of the elite or presiding over meetings of his social and business peers. Owens, by contrast, was foul-mouthed, ill-mannered and known to use his fists if he felt a situation warranted it.

Success at Last

Despite Libbey's business acumen and Owens' production savvy, the Toledo glass factory continued to lose money for the next three years. But its fortunes changed dramatically in 1891 after the company was given an extremely lucrative, short-term contract to blow light bulbs for a new enterprise called "Edison General Electric." The bulbs were blown under the supervision of Mike Owens in an old glass factory in nearby Findlay. As company profits grew in the 1890s, Owens turned his attention—and company money—to a continuing goal of his, the automation of the glassmaking process. Although he had no engineering training, he already had invented a semi-automatic machine to speed the production of light bulbs, lamp chimneys, and, eventually, drinking glasses. The rights to this new device had been assigned to a new firm, "the Toledo Glass Company," formed by Ed Libbey in 1895 to commercialize glassmaking developments being patented by Owens and others. The next year, Owens left his job as Libbey's glass factory superintendent to join Toledo Glass to devote his creative energy to developing a fully-automatic machine to blow bottles and jars—a need that had been apparent to Owens for some time.

During the last quarter of the nineteenth century, packaged foods, beverages, and medicines had become universally available to the general public as a result of breakthroughs in food processing and packaging technology. With the soaring demand for its products, the American glass industry soon was dedicating more than a quarter of its production to bottles and jars. Yet virtually all glass products manufactured in this country were being made by hand blowing techniques that had been in use for more than 2,000 years; methods that were extremely slow and very labor-intensive. Because the cost to make even simple bottles of the type we recycle or throw away today was excessive, the use of cheap child labor in the glass container industry was rampant and growing.

What Owens had in mind to replace the hand blowing process was some type of contraption that could suck molten glass into molds where jets of compressed air would automatically blow it into finished bottles. In 1903, some seven years and $500,000 later, he successfully introduced such a machine, a monstrous rotating mechanical marvel that could make bottles and jars at speeds that soon would reach twelve bottles per minute, or more than 17,000 in a twenty-four-hour period. This was nearly five times the productive capacity of the typical

hand blown shop where only 3,600 bottles could be produced in twenty-four hours. The new Owens machine eventually cut the labor force from eighteen men and boys per manufacturing station to six adult workers, decreasing the cost of producing a gross of bottles from $1.25 to less than ten cents per gross. The Owens machine not only revolutionized the glass industry but also had a tremendous impact on society in general. By drastically reducing the price of glass containers, it made them readily available for packaging foods, medicines, and beverages. And, because the new machine could produce containers of uniform weight and height, the federal government could, at last, establish uniform regulations to protect the consumer against fraudulent packaging of those essential products. In addition, the Owens invention virtually wiped out child labor in the glass factory. Prior to the introduction of the automatic bottle machine, children had represented about a quarter of the glass industry's work force—some 6,000 boys between the ages of ten and fifteen who worked ten-hour days, under appalling conditions, for as little as thirty cents a day.

After the new machine proved to be a commercial success, the Toledo Glass board of directors formed "the Owens Bottle Machine Company" in September 1903, to manufacture and license it. Because the new company's policy was to lease the machines, not sell them outright, its start-up initially was very slow. By January 1, 1909, more than five years after the Owens Bottle Machine Company was formed, only three of the nation's more than 100 bottle makers were using the machines. But, thanks to the early success of these first licensees, the momentum quickened, and by 1920 more than 200 Owens machines were in use in this country and many more throughout Europe. Nevertheless, even with this gradual success, the management of Owens Bottle Machine soon realized that the path to profitable growth lay in making *bottles*, not machines. Consequently, between 1909 and 1920, the company built or acquired fifteen glass factories. By 1919, when it changed its name to "the Owens Bottle Company," it was the nation's largest producer of bottles and jars.[4]

Merger and New Home

By 1920, the three major companies that Libbey and Owens had founded—Toledo Glass, Owens Bottle, and Libbey-Owens Sheet Glass—were all prospering. Unfortunately, neither of the glassmakers would live to see these companies grow to be the real giants they would one day become: Owens died in 1923, Libbey in 1925. But others were preparing to take their places as leaders of the American glass industry, including members of the Levis family of Alton, Illinois, who owned the Illinois Glass Company, the country's second largest glass container manufacturer. Illinois Glass had been started in 1873 by William Smith, an Alton farmer, and Edward Levis, a local furniture salesman with seven sons, all of whom would eventually work in the new glasshouse. The factory in Alton was a typical hand-blowing operation, but the Levis family was quick to recognize the profit potential of Mike Owens' invention. Illinois Glass became one of the first licensees of the Owens machine, and by mid-1915 every bottle produced by the Levis company was machine-made. Shortly after World War I, a new generation of Levises, sons of the seven sons, began assuming a leadership role in the company. Chief among these was William E. Levis, who became general manager of Illinois Glass in 1923. Meanwhile, the management of the Owens Bottle Company, concerned because their Owens machine licenses were beginning to expire, once more began looking at companies to acquire within the glass container industry. Illinois Glass was an especially appealing takeover target; it was number two in the industry, and it was very profitable, well-managed and the holder of Owens machine licenses that soon would expire. Merger negotiations between Bill Levis, by then president of Illinois Glass, and Bill Boshart, president of Owens Bottle, dragged on for several years before a deal was finalized in April 1929. The new corporation they formed, called "the Owens-Illinois Glass Company," was now the largest glass container manufacturer in the world, with assets of $48 million and more than 7,500 employees in sixteen factories across the U.S.

Toledo the New Home of the Merged Company

As a part of the merger agreement, the new company would be headquartered in Toledo, with Boshart, age 58, as its president and Levis, age 39, as vice president and general manager. To help him run day-to-day operations, Levis brought along two of his closest associates at Illinois Glass, Harold Boeschenstein and Randy Barnard, both of whom were still in their 30s. Boeschenstein would serve Owens-Illinois as general sales manager and Barnard as general factories manager.[5] It was apparent from the outset that Bill Levis and Bill Boshart were not getting along. At first, company old-timers thought their incompatibility reflected the long and acrimonious merger negotiations, but as the year progressed it was apparent that the two men genuinely disliked each other. It wasn't that either lacked experience; both were long-time glassmakers. Boshart, a Toledo native, had worked for many years at a Pittsburgh glass company before returning to Toledo to serve in a number of high level positions at Owens Bottle, becoming president upon Ed Libbey's death in 1925. Bill Levis, of course, had grown up in a glassmaking family where work at the Alton glass factory regularly was discussed at family gatherings by his father and his uncles. Also, he began working in the Alton factory as a teenager, learning the business from the ground up. No, the growing animosity between the two

senior executives was due to the dramatic difference between the two in how they handled their jobs. Boshart's management style was characterized by a co-worker as "autocratic and indecisive," whereas Levis was described as "people-oriented," with the ability to make a decision quickly and move on it.

Levis Takes Charge

In a normal corporate relationship, when a subordinate dislikes the way his boss runs things, he can either grin and bear it or resign and find another job. After trying the first alternative unsuccessfully for a few months, Levis determined that *he* would not be the one who would be forced to resign. With more than half of the family's proceeds from the merger taken in Owens-Illinois stock and placed in a private holding company, the family had become the largest single shareholder of Owens-Illinois, able to exert considerable control over the management of the new Toledo company. By late 1929, just a few months after the merger, Bill Levis informed the Owens-Illinois board he could no longer work for Boshart. In mid-January, 1930, the board's executive committee decided that Boshart should resign his presidency of the company and Bill Levis was immediately elected as his successor. *Officially*, Boshart resigned his position "for health reasons." He was 59 at the time, and would enjoy a long life, dying at 95 in 1966.

Bill Levis now was in complete control. However, the timing of the transition was not especially auspicious. The Great Depression of the 1930s already was impacting heavily on Owens-Illinois, with sales in decline and six of the company's factories already idled for lack of orders. Illinois Glass had grown and prospered as a family enterprise, created and nurtured in small towns like Alton, Illinois; Gas City, Indiana; and Bridgeton, New Jersey. Levis recognized the need to move his company into a new era of professional management and still maintain the paternalism that had characterized the company of his father and grandfather. The perspective of history appears to affirm he was the right man for this critical stage of the new company's development. During his two decades of leadership of Owens-Illinois, Bill Levis undertook an expansion and diversification program unparalleled in the history of the glass industry. In addition to acquiring a number of competitors, he moved the company into glass building block, fiber glass filters and insulation, metal cans, Kimble laboratory glassware, Libbey tableware, plastic products, metal and plastic closures, electrical insulators, plywood, television bulbs, and shipping cartons of all types.

Owens-Illinois Today

Today, eighty years after Bill Levis first began to diversify Owens-Illinois, the company has gone back to basics: It manufactures only glass containers—products of the type that began coming off Mike Owens' revolutionary machine more than a century ago. But the scope of its operations has changed dramatically. Since the glass container has always been a locally-made product, its weight, cube and fragility making it too costly to ship long distances, consumers in developing countries around the world have sought the transparency, inertness, purity, and environmentally-sound attributes of glass for packaging. With the universal availability of sand, the basic raw material for glass, as well as its easy recyclability, Owens-Illinois has built or acquired dozens of overseas facilities in Europe, South America, and the Far East to satisfy the demand in these global markets. As of late 2010, the Ohio-based company had revenues of $6.6 billion and operated more than eighty glass factories in twenty-one countries. It continues to be the world's largest manufacturer of bottles and jars for thousands of products used daily by millions of people of all colors, creeds, and nationalities. Mike Owens, Ed Libbey, and Bill Levis would be proud!

Notes

1. Primary sources include documents in the Owens-Illinois archives located in the Canaday Center at the University of Toledo's Carlson Library in Toledo, Ohio, and the following books: Warren C. Scoville, *Revolution in Glassmaking, 1880-1920* (Cambridge: Harvard University Press, 1948) and Jack K. Paquette, *The Glassmakers, Revisited* (Bloomington, IN: Xlibris Corporation, a division of Random House, 2009); *Blowpipes, A History of the Northwest Ohio Glass Industry in the Gas Boom of the 1880s* (Philadelphia: Xlibris Corporation, 2003); and *The Glassmakers, A History of Owens-Illinois, Incorporated, 1818-1994* (Toledo: Trumpeting Angel Press., 1994).

2. The Toledo *Blade*, January 1, 1888.

3. *Ibid*., March 1, 1890.

4. Mike Owens' inventive mind moved from the automatic bottle machine to a number of other innovations in glassmaking, including the development of equipment based on work by another inventive genius, Irving Colburn, to produce window glass automatically rather than by the traditional hand blowing methods still in use early in the twentieth century. Owens' work in this area would lead to the establishment in 1916 of the Libbey-Owens Sheet Glass Company, the window glass manufacturer that eventually merged with the Edward Ford Plate Glass Company in Rossford, Ohio to become Libbey-Owens-Ford.

5. Boeschenstein later became the first CEO of the Owens-Corning Fiberglas Corporation, established in 1938 by Owens-Illinois and the Corning Glass Works, and Barnard would have a similar position at Glass Fibers, Inc. (later, Johns-Manville Glass Fibers), which he founded in Waterville, Ohio in 1944.

Why the FICO Personal Credit Score Is a Useless Metric

The all-powerful credit score is less reliable than many think.

By H. Robert Schroeder

About the Author

Robert Schroeder, a member of the Torch Club of Trenton since 2008, will retire in January 2012 from the New Jersey Office of Emergency Management where he worked since 1995. A proverbial Renaissance man, Robert is an engineer, professional photographer and teacher, organist (both classical and theater organ), and freelance writer. Since 1998 he has written a monthly technical column, *Balanced Lines,* for his ham radio club's monthly newsletter, including the occasional book review. In 2009 he received the Bill Orr Award for Excellence in Technical Writing for an article in *QST Magazine*, the house organ for the American Radio Relay League. He also writes book reviews for the Institute of Electrical and Electronics Engineers publication *Technology and Society* magazine. Also a public speaker, Robert lectures on kabbalah, Freemansonry, Amateur Radio, and emergency management. He is currently writing two books, one on the history of emergency management and the other an inspirational autobiography.

Presented to the Trenton Torch Club on April 4, 2011.

Do you know your personal credit score? What was intended to be a measuring stick for money lending institutions for setting interest rates for individual borrowers has gone amok, undergone severe mission creep, unfairly branded millions of Americans as credit criminals, and unjustifiably ruined many a career. This essay will take a historical approach to account for how lending originated and how it morphed into the unbridled monster that it has become.

The History of Credit

We can thank twelfth- century Italy for inventing what we know as the bank. In the 1300s, bankers typically met in the city marketplace and openly competed to lend money at attractive rates, shouting out their lending deals just like the fruit and produce hawkers do today in open-air markets. In Florence, where much of this activity took place, the moneylenders transacted business in the town square on wooden benches that served as desks, risking the real probability that the loans would not be repaid. Ironically, the worst people one could lend money to were royalty because they never repaid the loan. When you have that kind of power, you can make the rules rather than follow them; hence, the old joke about the Golden Rule—"He who has the gold makes the rules." If a banker's business failed, it was the custom to smash his bench. This is where we get the term "break the bank" or "go bankrupt," and probably the word "broke" as well.[1]

Giovanni Medici, part of the ruling family of Florence, founded the Medici Bank in 1397.[2] With the population almost entirely Catholic, banks could not charge interest because Catholic law prohibited the practice of usury, commonly defined as the practice of lending money at unreasonably high rates of interest, following Jesus' example in Matthew 21:12 of casting the moneychangers and vendors out of the temple. The Medici had to figure out a way to charge interest and make a little profit, so they turned to the Jews for some legal advice. According to Leviticus 25:36, it is permissible for Jews to lend money at interest to anyone except his brother. The word "brother" in this context means a fellow Jew, or as cited in Deuteronomy 23:19, "You shall not charge interest to your countrymen…" which conveniently does not include Catholics. So while Catholics were not allowed to charge interest, Jews under their employ legally could.

Anything worth doing is worth doing for money and the lending of it is no exception. From the days of the ancient Hebrews to the reign of the Medici to modern times, lenders have charged a fee for the use of money. Barrons' *Dictionary of Finance and Investment Terms* defines *interest* as the cost of using money, expressed as a rate per period of time, usually one year—an annual rate of interest. For this kind of commerce it is perfectly reasonable to make a profit through the charging of interest, while at the same time remaining competitive with other lenders. Today the Internet can be of much assistance in comparing interest rates with interactive web sites such as LendingTree.com. The more lenders

compete, the more you'll save.

When Interest Gets Ugly

Nobody begrudges a lending institution the right to make a reasonable profit on lending money. The question arises, how do you set interest rates? Phrased another way, how do you gauge a borrower's credit? Taking its cues from the Medici, two men—an engineer and a mathematician—invented a credit scoring system that would revolutionize the lending industry and eventually strike fear and paranoia into the heart of every American. The two men, Bill Fair and Earl Isaac, began devising their scoring system in 1958 and eventually rolled it out in 1970. Unlike the royalty, many common borrowers always paid on time. What banks needed to find out was how to predict the odds of the people in between. Considering that Americans use credit cards roughly twenty billion times per year, that's a lot of lending. The system devised by Fair and Isaac made an educated guess as to whether a borrower could or would repay a loan, using a kind of predictive calculus called the Fair Isaac credit score. The corporation set up to implement this system became known as FICO and the score now bears its name.[3]

The infamous FICO score uses a scale that ranges from 300 (worst) to 850 (best). Your FICO score determines whether or not you will get a loan and what interest you will be charged. Credit card companies use this score to determine whether or not they will issue you a credit card and, if so, what your credit limit will be. The actual algorithm that determines your score is a closely guarded corporate secret; however, FICO does divulge the following factors that comprise your score:

1. Your payment history—approximately 35% of your score
2. Your debt (i.e. how much you owe)—approximately 30% of your score
3. The length of time you've had credit—approximately 15% of your score
4. Applying for or getting new credit—approximately 10% of your score
5. Miscellaneous factors—approximately 10% of your score

These scores are derived solely from your payment patterns and what your creditors report about you to the three credit rating agencies. By law, the FICO score may not consider race, creed, color, and whether or not you are on any sort of subsistence. To complicate matters, there is no single agency that collects payment information on you. In fact, there are three: TransUnion, Equifax, and Experian. Unfortunately, not all creditors report the same information about you to all of the three agencies. As a result, each of the three credit reporting agencies may yield three different credit scores. Why? There is only one Internal Revenue Service, only one Securities and Exchange Commission, and each state has only one tax department. So why do we need three different credit reporting agencies that often generate three different credit scores? As if this weren't enough, there is still more inequity. The information collected about you by TransUnion, Equifax, and Experian may be wrong.

Nearly every day we are bombarded with print ads and TV commercials warning us that our credit information may be wrong. Even the popular TV financial evangelists like Suze Orman and Jonathan Pond preach that our credit data is probably faulty and that we'd better check it for accuracy by obtaining our free credit report once per year. Then there's the issue of identity theft. Credit agencies could, and often do, mistake you for someone else. The theft of your Social Security number or your credit card could wreak havoc with your personal information. So why use the FICO score at all if it's probably wrong? This personal data is used to determine whether or not you have a place to live or get a job, yet by the credit industry's own admission, the unwritten caveat is that this information is probably wrong. Consider the analogy to a paratrooper in wartime about to jump behind enemy lines. As he dons his parachute and prepares to jump, his jumpmaster informs him that he's not sure whether or not the silk is any good or whether the parachute was packed properly. The paratrooper's very life depends on this parachute, but the person in command tells him up front that the parachute may be faulty. How would this make a jumper feel? More than a little queasy and apprehensive, I'd say. Yet this is exactly what you're being asked to do with your credit score.

American law is founded on the principle that one is presumed innocent until proven guilty. Such is not the case in the credit reporting world. When you check your three credit reports as the experts say you should and you discover an error, it's not an easy task to get the error expunged from those reports. Considerable time and effort on your part must be expended to correct some company's mistake. This is hardly fair, but the Golden Rule says "He who has the gold makes the rules." Another inequity about credit scores is that they can suddenly change for the worse without your knowledge or permission, yet it can take months or even years to raise your score back up to where you want it. The fact is, your

score may dip even though you do nothing wrong and pay your bills on time. If you're savvy about your personal finances, you probably know this already. It's bad enough that Americans are victims of this arcane and fault-ridden system for granting credit, but it gets worse.

Mission Creep

You may not know it, but your credit score is used, generally without your permission, by other entities such as your auto insurance company, potential employers, and the federal government. Not long after the FICO credit score was established, someone got the perverted idea that your predicted ability to pay your bills (which is what the FICO score is for) should have something to do with your likelihood of having an auto accident, your ability to hold a job, and your ability to acquire a federal government security clearance. In other words, these entities are equating creditworthiness with trustworthiness. The fact is that the two are totally unrelated.

Some time ago I heard a representative from the New Jersey Department of Banking and Insurance lecture on the exorbitant auto insurance rates we suffer here in the state. When she got to the part about determining rates and premiums, I asked why auto insurance companies obtain the applicant's credit score. She answered that on the surface, insurance companies look at the credit score to see how likely the applicant will be to pay premiums on time. Some insurance companies, however, make use of credit scores to predict whether or not the insured would be likely to sue in the event of an accident. The reason is to predict what kind of a liability the insured would be on the insurance company itself. The presumption is that a person with a low credit score would resort to devious means to get some extra cash by suing, let's say, for whiplash or some other kind of bodily injury. This generalization about human beings is so unfair that it's downright laughable. At this same lecture, I also learned that some auto insurance companies take into account your level of education. What possible connection could there be between having a college degree and not having a college degree? Luckily, there are a few insurance companies around that specifically advertise that they do not use these silly predictors when computing your premium.

The credit protection companies that advertise on TV strike fear into the hearts of honest Americans in other ways such as when you apply for a job, warning that some companies require the applicant's credit score in order to predict the person's honesty and trustworthiness. This practice is an absolute insult to anyone's intelligence. You haven't even been hired yet, and your potential employer already distrusts you. We are expected to believe the nonsense that knowing an applicant's credit score will spell the difference between stealing a pencil and stealing company secrets or company assets. My guess is that Ponzi genius Bernard Madoff had a sterling FICO score; yet where did that get him? He went to prison and his clients lost their investments. If a company uses a person's FICO score as a metric to determine the employee's honesty and integrity, then perhaps it is the applicant who should check the company's credibility. Unless you intend to purchase the company, your credit score is irrelevant and none of that company's business.

Get the Clearance, Clarence

Speaking of employment, federal agencies generally consider the applicant's FICO score when considering the individual for a security clearance. The same rationale applies: someone with a good credit rating probably has a sufficient income stream to enable them to pay their bills on time. If this is true, the assumption goes, the person being considered for the security clearance probably won't compromise government secrets by accepting a bribe. Sounds logical, right? Wrong! Here are two of several reasons why the FICO score is not a predictor of personal integrity vis–a-vis national security.

Former FBI agent Robert Hanssen was arrested in 2001 for espionage and selling secrets to the Soviets. Hanssen presumably held at least a Top Secret government clearance in order to have access to the valuable information that he sold to the Russians. It logically follows that Hanssen must have had a fairly high FICO credit score in order to be issued that clearance. Former agent Aldrich Ames was employed by the CIA. He too was arrested for espionage shortly before Hanssen was. No doubt both of these men had sterling credentials, yet each was found guilty of spying for the enemy. So exactly what did Hanssen's and Ames' FICO scores predict? Very little, obviously. It seems to be a human characteristic that you can never have too much money. Both of these federal agents had handsome salaries and lived comfortably, yet both chose to betray their country simply for money.

While avarice and greed are always good reasons to sell out your country, there is yet another: dissidence. During World War II, the brilliant and valued physicist Klaus Fuchs, a German immigrant who worked on the Manhattan Project in Los Alamos, felt no compunction about sharing America's nuclear secrets with the Russians. Though he strongly opposed

the Nazis and worked hard to see that America got the atomic bomb first, he felt it was reasonable to aid the Soviet Union since it technically wasn't our enemy at the time. The case of Klaus Fuchs is an early example of such compromise of government secrets. Since then, there have been dozens more cases. My point here is that no amount of creditworthiness can predict the actions of an individual who has a political agenda—loyalty oath be damned.

If It's Inaccurate, It's Useless

Before I conclude, let me say a few words about intelligence. I don't mean the type that you measure with an IQ test. I mean "information" that one gathers about something or somebody. During my several years in the intelligence gathering profession for a government agency, I learned that what we call actionable intelligence must possess three qualities in order to be useful and worth acting upon. First, the intelligence must be relevant. Second, it must be reliable and trustworthy. Third, it must be timely. As an example, let's look at the famed midnight ride of Paul Revere immortalized in Henry Wadsworth Longfellow's poem. On the night of April 18, 1775, Paul Revere and William Davies were assigned the mission to ride from Boston to Lexington to inform John Hancock and Samuel Adams about the approach of the British. History tells us that the invasion was across the Charles River, thus there were two lamps showing in the Old North Church's bell tower. This actionable intelligence was relevant, accurate, and timely. If someone were to tell you "the British are coming!" right now, this information would be relevant and accurate (yes, they did indeed arrive); however, it would hardly be timely. These facts were true around midnight on April 19, 1775, but the information isn't terribly useful today. The same criteria apply for the infamous claim that Saddam Hussein had biological and chemical weapons, and the equally embarrassing story about "yellowcake" uranium being found in Niger in October 2005. It is entirely possible that this information may have been true at the time these facts were reported. However, intelligence goes stale very quickly. Even true information comes with an expiration date.

These same principles apply to your own personal information, including your credit report. Few will disagree that the increasing attacks on our privacy are cause for concern. Data mining companies and our federal government unscrupulously capture our buying habits, magazine subscriptions, library borrowing information, and internet browsing history all in the hopes that they can deduce some kind of profile on each of us. But they can't do so with any accuracy. The fact is, any data that someone might accumulate about you and me means nothing. The presumed "personal" information that we all worry about is particularly worthless if it isn't confirmed to be correct. The data mining companies may dispute or repudiate this, but it's true nonetheless. What does all this mean to you? Take solace. You can leverage the fact that the information collected about you may be wrong. Unless the data collectors can be certain that their information is correct, merely possessing it is worthless. What's more, you can drive them crazy by manipulating the information they do get.

Conclusion

It is essential that you strive to be honest and diligent in your personal finances and pay your debts on time. It is sad but true that having an acceptable credit score is necessary to get a credit card, rent an apartment, or get a mortgage. It can take only a month or two to sink your credit score, yet "the system" dictates that it takes years to repair it. There are millions of people who once had admirably high credit scores; yet, through no fault of their own, our nation's economic downturn (or whatever euphemism you want to call it) has suddenly made them either unemployed or given a painfully reduced salary. Their credit scores are no doubt at rock bottom now. This casts serious doubt on the notion of predictability. In the term "credit history", the operative word is *history*.

Notes

1. Wikipedia, "Bank," http://en.wikipedia.org/wiki/Bank [accessed September 7, 2011]. We get the word "bank" from the Italian word *banco,* which means bench.

2. Miles J. Unger, *Magnifico: The Brilliant Life and Violent Times of Lorenzo de'Medici* (New York: Simon and Schuster Children's Publishing, 2009), 288; Tim Parks, *Medici Money: Banking, Metaphysics, and Art in Fifteenth-Century Florence* (New York: W.W Norton & Co., Inc., 2006), 6.

3. Wikipedia, "FICO," http://en.wikipedia.org/wiki/FICO [accessed September 7, 2011]; Aaron Pressman, "Can Fair Isaac Score Again?" *Bloomberg Business Week* May 5, 2008, http://www.businessweek.com/investor/content/may2008/pi2008054_620780.htm [accessed September 7, 2011]; Dean Foust and Aaron Pressman, "Credit Scores: Not-So-Magic Numbers," *Bloomberg Business Week*, February 7, 2008, http://www.businessweek.com/magazine/content/08_07/b4071038384407.htm [accessed September 7, 2011].

Women Scientists Who Have Won the Nobel Prize: More than Madame Curie!

Pioneering women paved the way toward gender parity in science.

By Anna Johnson-Winegar

About the Author

Dr. Anna Johnson-Winegar holds a BA in Biology from Hood College and an MA and PhD in Microbiology from Catholic University of America. She has published numerous technical manuscripts, and authored or co-authored several book chapters. She is a long-standing member of many professional societies, including the American Society for Microbiology, the Association for Women in Science, and Sigma Xi, and is a Fellow of the American Academy of Microbiology and past national Board Chair of the American Cancer Society. In 1998, she received the lifetime achievement award from Women in Science and Engineering. Upon her retirement from civil service, she received the Department of Defense Meritorious Service Award, Presidential Rank Award as a Meritorious Executive in the Senior Executive Service, the Gold Medal from the National Defense Industrial Association, and numerous other recognitions. In 2006, she was recognized as the Distinguished Alumna from Hood College. She is currently engaged in private consulting work for industry, academia, and government clients. An active member of her local church, she volunteers for numerous organizations, and serves on several non-profit boards.

Presented to the Frederick Torch Club on May 24, 2010.

Since the Nobel Prize awards were first given in 1901 under the bequest of Swedish chemist and engineer Alfred B. Nobel in the fields of physics, chemistry, physiology or medicine, literature, economics, and peace, the prize has been awarded forty-one times to women, twice to Marie Curie. Of those forty different women, twenty-five won the prize in non-scientific fields and fifteen in science.[1] It is not coincidental that eleven of the first fifteen women to win the Nobel Prize in science were born within a single generation (1896-1921) whose formative years spanned a strong women's movement, including suffrage campaigns, when social constraints on women's behavior moderated and when the effects of WWI impacted the work place. Those women Nobel laureates in science benefitted from personal support systems and demonstrated similar traits of passion, perseverance, patience, positive thinking, and a knack for solving problems.

Marie Curie

Marie Curie, born in Warsaw in 1867 to parents who were both teachers, shared the Nobel Prize in Physics with her husband, Pierre, and Henri Becquerel in 1903 for their description of the phenomenon of radiation. With some early scientific training from her father, fifteen-year-old Marie graduated first in her class in every subject, but the enormous strain brought the first of several physical breakdowns in 1883, requiring a year off to recuperate. In 1891 she went to Paris to study at the Sorbonne, where she concentrated her studies on physics and math. There she met Pierre Curie, a professor in the School of Physics, and they married in 1895. Although Marie dreamed of returning to her native Poland to teach, Pierre convinced her that she could do more and better research in France than in impoverished Poland, and so she stayed. Marie ultimately succeeded her husband as head of the physics lab, earned her doctorate in 1903, and later became the Director of the Curie Laboratory in the Radium Institute of the University of Paris, which had been founded in 1914 to honor the Curies.

Madame Curie's early research was conducted under very poor conditions. Laboratories were not well-equipped and the safety standards we know today were non-existent. Once the Curies had identified the radioactive elements of polonium and radium, they knew they had to purify tons of raw ore in order to extract a few grams of the radium salts. The only space they could use was an old shed which was stifling hot in the summer, freezing cold in the winter, and had no ventilation system. Marie's constant illness hindered her ability to work. In the process of isolating the radium salts, they continuously breathed in radon gas and, according to one source, their notebooks are still radioactive a century later. In fact, the Curies were too sick to collect their Nobel Prize.[2] Marie Curie showed her dedication to science by continuing her work, creating an almost impossible standard for future

"...We just have to realize that we're not doing our children a disservice when we're engaged in our jobs if we are also engaged in them."

women scientists despite the radiation sickness that resulted in four cataract operations and numerous burns on her hands from handling these materials. Marie Curie won her second Nobel Prize in chemistry in 1911 for her discovery of radium and plutonium. Although universities did not expect every male scientist to be an Albert Einstein, all women scientists were eventually measured against Marie Curie, who balanced her exceptional career with the responsibility of raising a family, assisted by helpers she could afford thanks to her wealth and prestige.

Irene Curie

Born into this scientific family in 1897, Irene Curie—who would receive a Nobel Prize in chemistry—inherited both the intelligence and strict work ethic of her parents. She studied in Paris, served as a nurse in World War I, and earned her doctor of science in 1925. Again under conditions known today to be unsafe, Irene was exposed to massive doses of radiation which ultimately contributed to her early death from leukemia. Much like her father, Irene talked very little but thought deeply and slowly. She was eight years old when her father was killed in an accident and she was subsequently raised by a single mother. Marie Curie organized a private school to ensure her daughter's education, and reinforced this school faculty with her professional colleagues. Marie herself taught experimental physics to this select group of students.

Throughout her adolescence, Irene never wondered whether she could achieve at her parents' level; rather, she studied the science simply because she loved it. When she was working in her lab, her co-workers described her as intimidating, direct and brusque—qualities which were hardly unusual, maybe even expected, in a man, but quite shocking in a young woman. Irene's marriage to Frederic Joliot established a complementary working relationship. Though contemporary observers attributed their success to Frederic's talent and Irene's loyal assistance—obviously underestimating her contributions to their work—she recognized their equal contributions when she gave the physics portion of the Nobel address and had Frederic give the chemistry section. This type of partnership between a woman scientist and a male colleague or spouse is a constant theme of women Nobel science laureates. Rather than feeling the need to compete with their male colleagues, the most successful women scientists have formed a partnership that was beneficial to both.

Rosalyn Yallow

Rosalyn Yallow, who won the Nobel Prize in physiology or medicine for developing a radio-immunoassay for peptide hormones, was born in 1921 in New York City and spent most of her life living and working there. While neither of her immigrant parents had the advantage of even a high school education, there was never a doubt that both of their children would go to college. Early in her schooling, Rosalyn was interested in mathematics, then chemistry. In the 1930s while at Hunter College, the world of physics was booming—particularly nuclear physics. Although her parents wanted her to become a teacher, she persisted in following her interest in this emerging field and landed a graduate position at the University of Illinois in 1941. At the first faculty meeting of the College of Engineering, she discovered she was the only woman among 400 members. It soon became evident that the draft of many young men into the armed services had made room for women in our graduate schools. After the U.S. entered WWII, much of the physics department was decimated when senior faculty were assigned secret research for the government. In the midst of a busy life of teaching, taking classes, and trying to find time for doing some research, she married in 1943 and earned her PhD in 1945 in nuclear physics. With encouragement from her thesis advisor, Maurice Goldhaber, she became quite skilled in making and using various types of equipment and tests for the measurement of radioactive substances. She eventually gave up her teaching and became a full time researcher, collaborating with Dr. Solomon Berson in a partnership that lasted twenty-two years. She later lamented that he did not survive long enough to share the Nobel Prize awarded in 1977 to her and their other colleagues. Their highly acclaimed work in the application of radioisotopes for clinical diagnosis of thyroid disease and the kinetics of iodine metabolism has been the cornerstone for many of today's medical procedures.

Barbara McClintock

Barbara McClintock won the Nobel Prize in physiology or medicine for her pioneering work on mobile genetic elements. Born in 1902 the youngest of three daughters of Dr. and Mrs. Thomas Henry McClintock, she was raised to be independent and often wound up playing with the boys in the neighborhood. She earned her degrees at Cornell: a BS in 1923, an MA in 1925, and a PhD in 1927. In the fall of

1921, barely two decades after Mendel published his work on the principles of genetics, her interest in this as-yet unrecognized discipline was sparked by the single course open to undergraduates in this new and exciting area. Another characteristic emerges here about successful women scientists: they often have an uncanny ability to see possibilities in new areas where there may be only limited information and interest. Barbara's interest in genetics was quickly noted at Cornell by Professor C. B. Hutchison, later the Chancellor at the University of California-Davis. He invited her to participate in the only other genetics course available, an invitation that cast the die for her future. At the same time, she took a course in cytology, focusing on the structure of chromosomes and their behavior at mitosis and meiosis. This combination of her interest in genetics and what she learned in cytology led her to decide on her topic for her graduate work in cytogenetics. She conducted her research with maize, associating the ten chromosomes with the genes they carry, settling into a routine of quiet winters analyzing data and busy summers growing the corn. In addition to her cornfield, she had a spacious laboratory where she worked seven days a week from early morning until late in the evening. The ability to devote all of one's energy and attention to the research at hand, sometimes shutting out the rest of the world**,** is another common characteristic of these women scientists.

Throughout her career, Barbara McClintock was ignored by many of her colleagues, partly due to the fact that she was a woman and partly because many of the scientists thought she was crazy with her ideas about genetics. However, most geneticists respected her work, understanding her experiments and their conclusions that transposable elements were the underlying factor in the results she obtained. Calling her work "one of the two great discoveries of our time in genetics," the Nobel committee awarded her the Nobel Prize in 1983, breaking with custom by not sharing the award among multiple researchers. Another distinction of her work is that the prize had never before been awarded for studies in higher plants. Dr. McClintock won only after it was clear that her work had implications far beyond maize, and beyond botany itself.

Dr. McClintock was often described as feisty and a loner. She was a modern woman for her time since she smoked, bobbed her hair, and wore golf knickers for her field work. She never married, and kept a highly scheduled life style. She reigned over her lab like a queen bee and everyone was afraid of her. One friend is quoted as saying "she is sore at the world because of her conviction that she would have a much freer scientific opportunity if she were a man".[3] The media made her out to be cold, but with close friends she was warm and charming. Another friend is quoted as saying "She's far ahead of her time and tries not to startle you with it. I think it's a defense mechanism from the time when it was important for women not to be brighter than others." Her fierce independence and dedication further illustrate characteristics of these successful women in science.

Elizabeth Blackburn

Elizabeth Blackburn, the most recent female winner of the Nobel Prize in medicine (2009), is a microbiologist and professor of biology and physiology at the University of California, San Francisco. A native of Australia, she was the second of seven children raised by two practicing physicians. Here again we see the advantage of growing up in a household where both parents are serious about their careers, and an environment which encourages the pursuit of scientific interests. She earned her BS and MS from the University of Melbourne, and her PhD in microbiology from Cambridge University, writing her thesis on the sequencing of nucleic acids. Her postdoctoral position at Yale led her into an area of research which would bring her international acclaim—the structure and replication of chromosomes, especially the role of telomeres, the tiny structures that cap the ends of the chromosome and contributes to the stability of all the genes. Her work has led to a better understanding of how stress causes cell aging and how telomeres affect many diseases, including cancer.[4]

Throughout her career, Dr. Blackburn has been dedicated to her responsibilities as a scientist as well as her commitments to being a wife and mother. She has exemplified the theory that every woman has the right to choose a career without fear of discrimination for embracing motherhood. For Dr. Blackburn, it's not a black-and-white issue, but rather a gradual recognition of the cyclical nature of work and family, finding the best way to distribute and redistribute time between the two over the course of a professional life. She refers to the most memorable week of her life when at age thirty-seven she became a full professor at UC Berkeley and at the same time learned she was pregnant! When many of us hear news of successful women like this, we celebrate their achievements, while thinking deep down inside that women like Dr. Blackburn do not know about the everyday grind and the work-life balance. In raising her family, Dr. Blackburn encountered many of the same issues every working mother

faces. She knew she had to make sacrifices, and she had her own guilt about working. In a recent interview, she commented on these issues: "I bumbled through it like everybody does. I don't think we ever went to a movie or traveled on vacation. I spent minimal time at conferences and hurried home to be with the family. You aren't a terrible parent if you aren't there after work every day baking cookies. I baked cookies—not such good ones, but I baked. I was helped by the fact that I was a full professor so I attended only those child-related events that I wanted to be at. I found that people will respect you if you take the time to make time for your children. Those of us who are working women will always have guilt, but the stay-at-home moms have guilt too—just a different kind. We just have to realize that we're not doing our children a disservice when we're engaged in our jobs if we are also engaged in them."[5]

Continuing Challenge of the Gender Gap

Although many gains have been made, stereotypes and cultural biases still impede further progress for women, according to a recent study by the American Association of University Women. Their report, entitled "Why So Few?," examined decades of research to look for ways to draw more women into science, technology, engineering, and math (STEM).[6] Although they found many small things that can make a difference, the report skirts the issue of whether innate differences between the sexes account for the paucity of women at the highest levels of science and math. Lawrence Summers, then the president of Harvard, sparked a real controversy when he suggested that "there are issues of intrinsic aptitude, and particularly of the variability of aptitude" reinforced by "lesser factors involving socialization and continuing discrimination."[7]

At the top level of math ability, where boys are usually over-represented, the AAUW report found that the gap is rapidly shrinking. Among mathematically precocious youth (sixth and seventh graders scoring more than 700 on the math SAT), thirty years ago boys outnumbered girls by 13 to 1, but now only 3 to 1. Even if there were underlying differences in the biology between the boys and the girls, cultural bias continues. Girls' performance often suffers from any suggestion, no matter how slight, that they do poorly at math. In spite of all the progress, a survey of 1200 female and minority chemists and engineers cites the persistent stereotype that STEM fields are not for girls or minorities.[8] Many say they had been discouraged from going into their chosen field, most often by a professor. Because most people choose careers where they believe they can do well, the report said girls' lesser belief in their skills may partly explain why fewer young women go into scientific careers. Data from the U.S. Department of Education state that in 1977 there were 233,775 male graduate students in science and engineering compared to only 77,914 females. Data from 2008 (the most recent year reported) show that now there are 231,997 females and 297,278 males in the fields of science and engineering. The report further stresses the need for more female mentors and role models.[9]

We are now well beyond the pioneering days of women's prominence in scientific careers. The growing gender parity in science suggests that many more women will be recognized for their contributions, whether it be an award at a local level, or within a professional society, or whether they achieve the international acclaim of a Nobel Prize.

Notes

1. Basic information on the Nobel Prize can be found at www.nobelprize.org/nobel_prizes/nobelprize_facts.html [accessed September 15, 2011].

2. See www.nobelprize.org/nobel_prizes/physics/laureates/1903/marie-curie.html [accessed September 15, 2011].

3. S.B. McGrayne, *Nobel Prize Women in Science; Their Lives, Struggles, and Momentous Discoveries* (Washington, DC: Joseph Henry Press, 1993).

4. "The Nobel Prize in Physiology or Medicine" at www.nobelprize.org/nobel_prizes/medicine/laureates/2009/blackburn.html [accessed September 15, 2011].

5. McGrayne.

6. Catherine Hill, Christianne Corbett, and Andresse St. Rose, *Why So Few? Women in Science, Technology, Engineering and Mathematics* (Washington, DC: American Association of University Women Press: March 2010).

7. Tamar Lewin, "Bias Called Persistent Hurdle for Women in Sciences," *New York Times*, March 21, 2010.

8. National Science Foundation, National Center for Science and Engineering Statistics, "NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering," www.nsf.gov/statistics/showsrvy.cfm?srvy_CatID=2&srvy_Seri=2 [accessed September 16, 2011].

9. U.S. Department of Education Institute of Education Sciences, National Center for Education Statistics, *Digest of Education Statistics, 2008* (March 2009), chap. 3, http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2009020 [accessed September 16, 2011].

John Calvin at 500

The Protestant Reformation owes much to this early Swiss theologian.

By W. Bruce MacKenzie

About the Author

Bruce Mac Kenzie, a native of California, graduated from the University of California, Berkeley, in 1950 with a degree in English, and from the Pacific School of Religion in 1953. After serving two Congregational churches in Calaveras County, CA, he moved to the Bay Area, where he was Youth and Student Director for the Congregational Conference for five years. In 1960, he was called to the Washington Park United Church of Christ in Denver for a fruitful ten-year ministry. In 1970, he was called to the First Congregational Church, UCC, of Boulder, serving for twenty-seven years until his retirement in 1997. He and his late wife, Jeanette, had four children and five grandchildren.

Presented to the Boulder Torch Club on October 21, 2010.

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Born in France in 1509, John Calvin was probably the greatest reformer of the sixteenth century—brilliant, a visionary with no intellectual equal. This presentation may come as a surprise to some who have always seen him in their imagination with horns and wreathed about with the incense of hellfire and brimstone. Calvin, who described his young self as awkward, timid, and bashful, came from modest means and, by sheer talent, progressed through the elite world of the French Renaissance. In Reformation theology, Luther expressed what it meant to be saved by God through Grace; Calvin's genius was to discover the Church. He saw the Christian Life as a communal journey.

Early Life

As a child Calvin read Cicero every year, and in his seminary studies in Paris took the Apostle Paul as his Biblical model. Adopting a college schedule that carried over into his adult life, he rose at 4:00 am and stayed up to at least 9:00 pm. His food fare was very simple, and he prayed much. In 1528, he arrived in Orleans to study law with the "Prince of French Lawyers"—Pierre de l'Estoile. His friend Beza draws attention to Calvin's extraordinary appetite for knowledge and intellectual energy. "Calvin worked hard at his university studies and there are still trustworthy men who can testify that he often stayed up until midnight to study and ate hardly any supper in his eagerness for work. Each morning when he awoke, he would stay in bed for a few moments while he recalled to mind all that he had studied the previous day and mulled it over."[1] Beza added that Calvin's regime of study prepared him for his "profound scholarship in the study of Holy Scripture and helped him to develop his remarkable powers of memory." Such long hours of study meant lasting damage to his health.

The study of law led him to speak about the Holy Spirit as witness, the need for and nature of justification, God as legislator and judge, and Christ as perpetual advocate. He revolutionized the art of interpreting scripture, publishing in 1539 his famous preface to the commentary on Romans. A great admirer of Roman law, he applied it later to Geneva. Attracted to the stoic ideal of community, he rejected the virtue of life seen by his fellow citizens as merely individualistic. The enduring legacy of his legal training on his theology was enormous. His positive account of the law, by which believers are taught the will of God, his attachment to order and discipline in the church, and his emphasis on the majesty of God all flow from his training in law.

After returning to Paris in 1531, where his conservative upbringing was displaced by Renaissance values of free inquiry, accurate scholarship, and good writing, Calvin experienced a sudden change in the autumn of 1533. He wrote, "God by a sudden conversion subdued and brought my mind to a teachable frame, which was more hardened in such matters than might have been expected from one at my early period of life. Having thus received some taste and knowledge of true godliness, I was immediately inflamed with so intense a desire to make progress therein."[2] Conversion was essentially a shift of allegiance from the Church of Rome to the Word of God. Conversion was the beginning of a long journey, not its conclusion. The Evangelicals, as those with such radical views were called, came into conflict with the Sorbonne, and Calvin fled to the south of France for about a year, filling his time with study. He pored over editions of the church fathers, which he soon could quote from memory. But finally, in response to God's call, he had to leave France and go into exile.

In 1534, Calvin landed in Basle, home to his much-admired Erasmus, where he set about studying Hebrew. He also drafted *The Institutes of the Christian Religion*, a work of astonishing depth, elegance, and penetration for a young man of twenty-five who had never studied formal theology. Calvin was constantly revising and editing the work until the final edition in 1559. Beginning with his famous line, "Nearly the whole of sacred doctrine consists in these two parts: Knowledge

of God and Ourselves," Calvin declared that God is not distant, but present in the world with the faithful. God accompanies those who journey through the world, not from afar, but through the indwelling of the Spirit.[3] These views are a hint of the nature of Calvin's conversion—an intimate and comforting sense of the nearness of God. Home for Calvin is not a location, but union with God. He sought to teach and persuade the faithful to lead the Christian life characterized by love and sacrifice.

Emergence of a Theological Radical

By 1533, Calvin was whole-heartedly on the side of the Reformation that was developing in Europe. Whenever this change took place, it was radical and decisive. He desired a life of scholarship and relative peace, but for some time Calvin had been learning the lesson which he found hardest for him—that his will was not the will of God. He wrote in 1534, "I have learned from experience that we cannot see very far before us. When I promised myself an easy, tranquil life, what I least expected was at hand."[4] Returning from a visit to France, he made a detour through Geneva, where the confrontational William Farel, who had joined the Eidguenots in abolishing the Catholic mass and making Geneva a Protestant city with Gospel preaching in 1535. He had intended to spend one night there before moving on to Strassburg and literary ease, but he was invited by the fiery Farel to help in the work of reforming the Geneva church. Calvin refused! But Farel exhorted him with prophetic power: "You are simply following your own wishes; and I declare in the Name of Almighty God that if you refuse to take part in the Lord's work in this Church, God will curse the quiet life that you want for your studies!" Wrote Calvin, "I felt as if God from heaven had laid His mighty hand upon me to stop me in my course….and I was so stricken with terror that I did not continue my journey."[5] Calvin sought to make the Geneva Church both national and confessional, convinced it was God's instrument for salvation through the preaching of the Gospel in the language of the people and the administration of the sacraments to all morally worthy laymen. By 1538, Calvin was denouncing the local rulers from the pulpit, determined like Farel that the affairs of the Church should not be determined by the civil magistrates. When the two reformers preached as usual the day after being banned from the pulpit by the ruling Councils, both Calvin and Farel were exiled from the city.

Calvin enjoyed three peaceful and happy years there, continuing his writing, ministering to an appreciative church, attending theological and ecclesiastical conferences, and marrying Idelette de Bare. In 1539, with the revision of *The Institutes*, Calvin stood among the front ranks of Protestantism. In 1540, he published his commentary on Romans, which radically transformed protestant theology. In the thirty-two years between the publication of his first book and his death, he created a comprehensive body of literature, some forty-eight volumes. Calvin insisted that a commentator remain humble because full wisdom is not granted to any one person, and that God's Word must be received in the context of the human social community to offset the unequal distribution of God's gifts. A commentator's sustained conversation with ancient and contemporary interpreters was in the service of the Church, guided by the Spirit, and grounded in the Word of God. Calvin gratefully admired Paul, and thought that he could be the voice of Paul in his own time.

One of Calvin's most controversial theological ideas was Election, citing God's choice of Jacob over Esau (Malachi 1:2,3a) even before the twins were born, and thus apart from their good or bad deeds. Citing Paul's writings, Calvin asserted that "as the blessing of the covenant separates the people of Israel from all other nations, so also the election of God makes a distinction between men, while he predestines some to salvation, and others to eternal condemnation. There is no basis for this election other than the goodness of God alone, and also his mercy, which embraces those whom he pleases, without any regard whatever to their works. The Lord in his unmerited election is free and exempt from the necessity of bestowing equally the same grace on all. Rather, he passes by those whom he wills, and chooses whom he wills."[6] The human mind cannot comprehend God's election, nor was it ever intended to do so. The life of the Christian within the Church is centered on the doctrine of justification by faith alone.

The expulsion of Farel and Calvin had not brought about the peace desired by their opponents and for three years Geneva remained in turmoil. With the help of friends there, Calvin returned to Geneva in 1541 amidst a changing world of urban reformation in German and Swiss lands. He established a set of Ecclesiastical Ordinances requiring all to work together to build the Godly society. Ministers were to preach the Word of God and oversee the Christian life of the community. Calvin served as presiding officer, or Moderator, of the Company from 1541 until shortly before his death in 1564. Under the Ordinances**,** all infants were required to be baptized, and the Lord's Supper was to be celebrated four times a year**:** Christmas, Easter, Pentecost, and the first Sunday in September. Genevans were required to attend worship on Sunday and Wednesday, the latter regarded as a day of prayer. Preaching became central, along with collective study of scripture. Calvin preached almost every day of the week for one hour; to promote private and public Godliness, instruct, edify and correct. Union with Christ was Calvin's central theme.

To his opponents Calvin seemed

harsh, severe, and unrelenting; but among most colleagues, he commanded great respect. Serious, intense, deeply spiritual and disciplined, he arose early and began his day with prayers before going to work. There was no idle time. He lived each day in the presence of God; all activity was consecrated to the Lord. Calvin never doubted the special nature of his calling or his position in the Geneva Church, and the wider Protestant Church, but he always had a sense of not doing enough. In 1544 he wrote a treatise "On the Necessity of Reforming the Church." It was an attempt at unity with Luther, Zwingli, and other Reformers; a statement of what united Protestants, which was true worship of God and knowledge of salvation, the heart and soul of the Reformation.

Calvin's Theological Leadership

From time to time, Calvin was involved in theological disputes within Geneva as well as abroad. A notable scar on his reputation arose from his quarrel with the Spanish lawyer/doctor/theologian Servetus, whose unorthodox denying of the dogma of the Trinity shocked every right-thinking person of his day. In 1553, he published a book setting forth his views and, hoping to strike a blow to Calvin, sent several copies to Geneva. Estienne, the Geneva bookseller, promptly destroyed them. This book, however, placed Servetus in the class of wanted men. Since heresy had been made a capital offense a decade earlier, the Geneva Council convicted Servetus of that crime and had him burned at the stake at the age of forty-four. Although Calvin took no part in the final decision, his approval of Servetus' death remains a blot on his image.

Calvin was in written communication with reformation movements all over Europe. Calvin wrote to reformers in Somerset, England, "We hold God alone to be the sole Governor of our souls, that we hold his law to be the only rule and spiritual directory of our consciences, not serving him according to the foolish inventions of men. Also, that according to his nature he would be worshipped in spirit and in purity of heart. On the other hand, acknowledging that there is nothing but wretchedness in ourselves, and that we are corrupt in all our feelings and affections, so that our souls are a very abyss of iniquity, utterly despairing of ourselves. And that, having exhausted every presumption of our own wisdom, worth or power of well-doing, we must have recourse to the fountain of every blessing, which is in Christ Jesus, accepting that which he confers upon us, that is to say, the merit of his death and passion, that by this means we may be reconciled to God."[7]

Likewise he wrote to the Dutch in Antwerp in 1556 intending to counter widespread dissembling among Dutch evangelicals, "No doubt, it is not everything to read and to hear, for our chief end is to give to God in all holiness and perfection, and though we cannot persevere in that course till we are stripped of this corruptible nature, yet we have to walk in uprightness of life, and serve with a pure conscience that God of mercy who has set us aside for himself. But because of our natural infirmities and because, surrounded as we are by so many temptations, we speedily lose sight of our high calling and thus fail to acquit ourselves of our duty, our natural inconstancy transporting us hither and thither all the while, we have much need to avail ourselves of the aids which God has afforded us. Therefore my brethren, exercise yourselves not only by reading in private, but also by assembling yourselves in the name of Jesus Christ, in order to call upon God and receive profitable instruction, that you may advance more and more."[8]

Assessing Calvin's Influence

According to biographer Bruce Gordon, "Sustained by the Word of God and fed by the body of Christ, Calvin believed the faithful are almost home: they have one foot in the kingdom. Perfection comes in the next world. Until then women and men must live in imperfect communities locked in an unceasing struggle to maintain faithfulness to God's commandments. Calvin never underestimated the task. He believed there was no one form of Christian community. As long as God's commandments are obeyed and Christians live together in love the external forms of community could vary according to necessity. This was Calvin's long held view of accommodation. The more important question was whether obedience of God was preserved. This message made Calvin the most powerful voice of his generation."[9] That God should choose anyone for salvation was an extraordinarily generous act and something for which Christians should be thankful.

In his own testament, Calvin drew attention to his shortcomings. "But alas, my desires and my zeal, if I may so describe it, have been so cold and flagging that I am conscious of imperfections in all that I am and do."[10] This was Calvin's divided self: the confidence in his calling as a prophet and apostle set against his ever-present sense of unworthiness and dissatisfaction. It was this friction that drove him ceaselessly to improve his work, to write clear, more insightful commentaries, to rework the *Institutes* to enhance their teaching value, and to travel endless miles of dangerous roads in search of church unity. His acute sensitivity to the gap between what was and what should be distressed him. He knew there would be no Jerusalem on earth, but he never stopped trying to build it. Toward the end of his life he declared, "Although believers are now pilgrims on earth, yet by their confidence they surmount the heavens, so that they cherish their future inheritance in their bosoms with tranquility." (Romans 5:2)

In 1555, Calvin became aware of failing health and too much daily grind—

migraines, bowel problems, and gout. His appeal was great and he drew large congregations. He preached morning and afternoons to accommodate the crowds. His central theological argument was the twofold knowledge of God: God as creator and God as savior. Obedience, submission, and humility—these were the watch words of Calvin's view of the Christian life as expressed from the pulpit and the printing press. Calvin performed his last public duties in February 1564 and died shortly after at age fifty-six. When he died, all Geneva desired to see his body, as if he were a medieval Saint or one of those relics that he had so mocked, but he had seen to it that there should be no posthumous canonization and left orders that he should be buried in an unmarked grave. Thus his death and burial were of one piece with his life; as a good witness, he bent all his energies in life and death to making Jesus Christ alone great, and making that greatness visible.

Calvin was like an Old Testament prophet in that he proclaimed the Word of God both by words and by actions. In that sense, the course of his life takes on a certain sacramental reality. It bore visible witness to the gospel he preached. It is this harmony or consistency that gives a particular significance to Calvin's life. It is the same challenge for today's Christians.

Notes

1. Theodore Beza, *The Life of Calvin* (1575), trans. Henry Beveridge (Edinburgh: Calvin Translation Society, 1844), 16.
2. Bruce Gordon, *Calvin* (New Haven: Yale University Press, 2009), 33.
3. *Ibid*., 60.
4. T. H. L. Parker, *Portrait of Calvin* (London: SCM Press, 1954), 24.
5. *Ibid*., 25
6. Gordon, 114-15.
7. *Ibid*., 254.
8. *Ibid*., 272.
9. *Ibid*., 276.
10. *Ibid*., 334.

2012 Paxton Lectureship Award

The Paxton Award, created in honor and memory of W. Norris Paxton, past president of the International Association of Torch Clubs and editor emeritus of *Torch*, is given to the author of an outstanding paper presented by a Torch member at a Torch meeting. The winning author for the 2012 Award will receive an appropriate trophy, a $250 honorarium, and paid registration to the 2012 IATC convention in Portsmouth, VA. The winner will be introduced at the convention banquet where he or she (or a designated representative) will deliver the paper on June 23, 2012.

Eligibility: The author must be a member of a Torch club and the paper must have been delivered to a Torch club meeting or a regional Torch meeting between January 1, 2011 and December 31, 2011 (inclusive). Current officers and directors of IATC are ineligible for this award during their terms of office.

Procedure: All papers to be published in *Torch* should be sent to the IATC Office, Attn. Editor, 11712C Jefferson Ave., Newport News, VA 23606, along with the current Manuscript Submission Form (available from the club secretary or IATC Office), duly signed by the author and a club officer. Paxton candidates will be selected by the Editorial Advisory Committee from all papers submitted for publication in *Torch*. The Paxton Award Committee will consider the EAC-recommended 2011 papers in the spring of 2012 to determine the 2012 award winner.

Judging: The reading and judging panel comprises five people: a member of the Board of Directors of the IATC, one of the last five winners of the Paxton Award, a member of the Editorial Advisory Committee, and two members selected by the IATC Board of Directors. Judging is based on the principles set forth in the IATC brochure "The Torch Paper," available from the IATC Office, and the "Manuscript Submission Suggestions" at the Publications link of the IATC website www.torch.org. The winner of the Paxton Award and other contestants will be notified early in May 2012.

Additional Information:

- A publishable Torch paper should be approximately 3,000 words in length.
- Local clubs are not allowed to submit papers directly for Paxton consideration.
- The Paxton Award paper will be published in the Fall 2012 issue of *Torch*.

Index to *The Torch* – Volume 84, Fall 2010–Spring 2011

BY AUTHOR

BY TITLE

Call to Annual Business Meeting and Torch Convention–Portsmouth, VA–June 21-24, 2012

Thursday, June 21: 3:00pm Officers' Exchange; 4:00pm Business Session I; 5:30pm Dinner & Torch Paper #1

Friday, June 22: 8:00am Membership Development; 8:45am Business Session II; 10:00am Torch Paper #2; 11:15am lunch & Tours; 5:00pm harbor tour on stern wheeler Carrie B. with music, dinner and Silver Awards

Saturday, June 23: 8:15am Membership Development; 9:00am Torch Foundation Membership Meeting; 10:00am Torch Paper #3; 11:15am lunch & Tours; 6:00pm Banquet, Gold Awards, Paxton Paper (black tie optional)

Sunday, June 24: 7:30am Breakfast; 8:00am Interfaith Session; 9:00am Torch Paper #4;10:30am Business Session III

2012 Convention Speakers

Thursday, June 21 – Torch Paper #1

Human Evolution: A Decade That Changed the Narrative of Our Past. – Dean Burgess, AB Kenyon College and MLS University of North Carolina at Chapel Hill. He is the retired Director of the Portsmouth Public Library and is an actor/director, a published novelist, an historian, and the long-time Secretary of the Portsmouth Torch Club.

Friday, June 22 – Torch Paper #2

Meandering To The Beat Of A Different Drummer: Some Words About Classical Music. – Rabbi Arthur Z. Steinberg is a graduate of the University of Maryland (Social Psychology), and was ordained at the Hebrew Union College, Cincinnati, Ohio. He served as a part-time classical music announcer on WHRO-FM, the Fine Arts Public Radio station in Hampton Roads, for eleven years. He is an active member of the Portsmouth Torch Club.

Saturday AM, June 23 – Torch Paper #3

The Early History of Norfolk and Portsmouth. – Robert B. Hitchings is the Head of the Sargent History Room at the Norfolk Public Library. His undergraduate degree in history is from Virginia Wesleyan. He has studied history at Emanuel College Cambridge and at Westminster Brooke College Oxford. He is a seventh generation Norfolk resident.

Saturday PM, June 23 – Torch Paper #4

The winner of the *The Paxton Award* for the best paper submitted to the TORCH magazine this past year will present that paper at the Paxton Award Banquet.

Sunday, June 24 – Torch Paper #5

Art–Where Does It Come From? – Betsy Rivers Kennedy earned her BA from Virginia Tech and did graduate work in art at the University of Houston and at Old Dominion University in Norfolk, Virginia. A published calligrapher, she was Founding President of the Houston Calligraphy Guild and President for 15 years of the Artists' Association at the D'Art Center in Norfolk. She has taught for many years at the International Calligraphy Conference and maintains an active studio in Norfolk as an artist and calligrapher. She is an active member of the South Hampton Roads Torch Club and is married to fellow Torch member Jack Kennedy.

"400 YEARS OF HISTORY, WATERWAYS AND ART"
2012 Int'l Torch Convention
Portsmouth, VA, June 21-24, 2012

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or write him at his address below.

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Mail check to:
Allan Whitney, Treasurer
Portsmouth Torch Club
P. O. Box 3247
Suffolk, VA 23434-9998

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Hotel Reservations are not included in the registration fee.

Make reservations directly with the Renaissance Hotel and Waterfront Convention Center, Olde Towne Portsmouth
425 Water Street, Portsmouth, VA 23704
1-757-673-3000 or 1-888-839-1775

Room rate is $119/night plus tax and includes garage parking and internet access (mention Torch to get this rate). Hotel reservations do require a credit card but do not require a deposit. For more details, see Convention Details at **www.torch.org**. For further information contact **Dean Burgess** at **redlion3@juno.com**, or **757-393-0973. Our response to your registration will include detailed tour information and will ask for your tour and meal choices.**

TOURS OFFERED

Portsmouth Stained Glass Tour

Visit the interiors of five churches with Tiffany, Victorian German, cathedral, and slave made glass.

Downtown Norfolk Tours

Choose among Nauticus, the Hampton Roads Naval Museum, the Battleship USS Wisconsin, the MacArthur Memorial Museum, Fort Norfolk, the D'Art Center, the Moses Meyer House, the Willoughby-Baylor House, Saint Paul's Episcopal Church, and portions of the Cannon Ball Trail.

Downtown Portsmouth Tours

Choose among Lightship Portsmouth Museum, Portsmouth Naval Shipyard Museum, Courthouse Galleries, Virginia Sports Hall of Fame & Museum, Children's Museum, Jewish Museum & Cultural Center, and Trinity Episcopal Church.

The Chrysler Museum

This major museum has one of the best collections of art in the nation, boasts a world class art glass collection, and has built a new art glass creation workshop for artists.

Historic Homes In Portsmouth

Tour three homes (dating from 1784, 1820, and 1860) in the exquisitely preserved Historic Olde Towne District.

Sightseeing On the Way

From the north (13, 64, 264)
Chincoteague Island, Chesapeake Bay Bridge-tunnel (one of the longest), ocean beaches, Virginia Marine Science Museum (aquarium in Virginia Beach), Gardens By the Sea (botanical gardens), Virginia Zoo.

From the northwest (64, 664, 164)
Williamsburg, Jamestown, the Yorktown battlefield, plantations on the James River, Mariners' Museum in Newport News, NASA Air and Space Museum in Hampton.

From the southwest (10, 17, 164)
Chippokes Plantation, Bacon's Castle (17th century), charming Smithfield (where the hams come from), St. Luke's Church (from the 1600s) and views of the port of Hampton Roads.

From the south (ferry to 12, 168, 464)
Ocracoke Island, Hatteras lighthouse, Outer Banks (national seashore), Lost Colony (outdoor drama at Manteo), Wright Brothers museum at Kill Devil Hills (home of the first powered flight), Intracoastal Waterway.

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Reflections

Saying [what you believe in] brings it into an existence that it didn't have in silence.
—Jonathan Safran Foer
(foreword to *The Diary of Petr Ginz*, 2007).