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## 1. Our Evanescent Culture

### **And the Awesome Duty of Librarians**

How secure is our civilization's accumulated knowledge?

It is a question that, in a fundamental sense, transcends many life-and-death concerns (threats of sickness, natural disaster, or military invasion) that prompt us collectively to spend fortunes on insurance, health care, and weaponry. We know that we each individually will die, though we are willing to go to great lengths to delay the event as long as possible. But we have an overarching shared interest that the world of ideas will go on without us: that our descendants will continue to compose music, invent tools, refine scientific knowledge, and write histories, extending into the indefinite future the cumulative, constantly evolving universe of signs, symbols, and skills that have enriched our lives. Cultural death—the passing of the wisdom, artistic creations, and practical knowledge of an entire people, painstakingly built up over many generations—is a loss almost too wrenching to contemplate.

Yet cultural death happens. The examples from history are legion. Anthropologists and archaeologists have identified well over 10,000 distinct human cultures, of which most have perished, many by absorption into one multi-ethnic civilization or another. Linguists have catalogued over 6,000 human languages; again, most are extinct or endangered, often for a similar reason—absorption of indigenous populations into multi-ethnic urban civilizations. But civilizations are also mortal: about 24 are known to have existed over the past 5,000 years, and again most are now dust.

Here is perhaps the most salient fact: when past civilizations were in the process of decline and collapse, they seem to have given insufficient thought to preserving the best of their achievements; indeed, the reverse often happened—libraries were burned, statues defaced, tombs looted. Archaeologists make heroic efforts to piece together the histories of these vanished empires, but they face enormous hurdles. Even the monumental and long-lasting civilization of ancient Egypt left behind more questions about itself than answers: we're not even sure how much arithmetic and geography the average educated Egyptian knew.

It might seem that our own civilization's achievements are less

vulnerable. After all, the sheer weight, volume, and variety of contemporary cultural materials is unprecedented, including hundreds of millions of books, and more hundreds of millions of newspapers, magazines, paintings, sculptures, photographs, motion picture films, phonograph records, CDs, DVDs, websites, and on and on.

But all this volume and diversity may be deceiving. In some respects our culture is arguably more ephemeral than most others, and a surprisingly large proportion of our cultural materials is in danger of being swept away with astonishing speed, leaving virtually no trace—like a candle flame vanishing in a puff of wind.

If we want future generations to have the benefit of our achievements, we should start thinking more seriously about what to preserve, and how to preserve it.

### *The Ascendancy of Electronic Media*

The survival struggle of America's remaining newspapers is symptomatic of a trend that began in the 1970s, when computers began finding their way into businesses, schools, and homes. Today many of us get our news from the screen, not from the local print daily—and the proportion is growing. Major newspapers like the *New York Times* now have robust websites to accompany their print editions; but many industry forecasters say the print editions may not survive. Even before the beginning of the current recession, newspaper advertising revenues were declining steeply, and this year daily average circulation for 395 newspapers has fallen 7.1 percent to 34.4 million (from 37.1 million last year). In recent months the *Rocky Mountain News* and the *Seattle Post-Intelligencer* have ceased print news operations, and both the *Chicago Sun Times* and the *Tribune* have filed for bankruptcy.

The magazine and book trades are likewise evolving quickly under pressure from the Internet. Something like 50,000 new book titles still appear each year, and the book industry remains profitable in most years; however, according to *Book Industry TRENDS 2009*, many insiders think advances in digital publishing will force an unprecedented transformation of the industry, as ever fewer books are released in print versions and more in online or e-book formats—a trend already sweeping the textbook sector.

As with newspapers, most magazines now publish their content online, and some (like *The Ecologist*) have already gone all-electronic, jettisoning their print versions. Perhaps the most economically secure of print publications are also the most ephemeral in their content—*People* magazine and other fixtures of the supermarket checkout line.

The production processes for books, magazines, and newspapers—from writing to typesetting, printing, and distribution—are already thoroughly computerized.

Digitization has nearly completed its takeover of the motion picture, photography, and music industries. Just try to buy a package of Kodachrome film for your 35mm camera, or an analog recording of your favorite band's latest songs. And with the explosive growth of I-

tunes, YouTube (and other sources of streaming video), and online photo galleries, the Internet is gradually becoming the primary delivery medium for all these media.

Libraries are being forced to adapt, as they face enormous pressure to expand digital media at the expense of traditional media. For archivists, the emerging trend can be summarized in one word: *digitization*. Whether the original exists on paper, vinyl, or celluloid, its future lies in endless strings of ones and zeroes encoded on magnetic or laser-etched media, which will presumably preserve the original content while making it accessible to millions or billions of people today and in future generations.

At the same time, the very function of libraries is up for grabs: a [presentation](#) at the 2008 American Library Association conference reported in *Library Journal* suggested that libraries should be “more and more a place to do stuff, not just to find stuff. We need to stop being a grocery store and start being a kitchen.” As libraries become multi-purpose cultural centers (in many occasions serving as informal daytime homeless shelters), one of their primary practical functions is the provision of free public Internet access, with computer included. Yet these new demands and functions arrive at a time when funding for libraries is shrinking, as city and state budgets are downsized to fit evaporating tax revenues.

Preservation of digitized knowledge can become a problem simply because of obsolescence. Think of the billions of floppy disks manufactured and encoded during the years between 1980 and 2000: few of us still have working computers capable of retrieving the data on those disks. But this is hardly the worldwide information system’s point of greatest vulnerability.

Ultimately the entire project of digitized cultural preservation depends on one thing: electricity. As soon as the power goes off, access to the Internet goes down. CDs and DVDs become meaningless plastic disks; e-books become inscrutable and useless; digital archives become as illegible as cuneiform tablets—or more so. Altogether, digitization represents a huge bet on society’s ability to keep the lights on forever.

Without precious kilowatts, what would survive? Sculpture and architecture would persist. Previous generations of sound and visual media might be decipherable: old phonograph records could still be made to emit music, given a hand crank, needle, and megaphone, and silent films would be relatively easy to show. Books and collections of physical newspapers and magazines would fare reasonably well for a few decades, but deteriorating acid-laden paper threatens the survival of about 85 percent of books and nearly 100 percent of newspapers and magazines (ancient books written on parchment and acid-free paper could last many more centuries).

It’s ironic to think that the cave paintings of Lascaux may be far more durable than the photos from the Hubble space telescope.

Altogether, if the lights were to go out now, in just a century or two the vast majority of our recently recorded knowledge would be gone or inaccessible.

## *How Likely Is Blackout?*

If we could be fully confident that a more-or-less permanent blackout is unthinkable, then this discussion would be a purely academic exercise. Where might such confidence come from?

Two questions could help us assess the magnitude of risk: *What has to go wrong for the lights to go out?*, and, *What has to go right for them to stay on?*

Here's a short list of what would have to go wrong:

- **Failure to replace aging infrastructure.** All knowledgeable observers agree that North America's electricity grid system is overdue for a massive upgrade. According to electrical industry consultant Jason Makansi in his 2007 book *Lights Out: The Electricity Crisis, the Global Economy, What it Means to You*, "You almost can't read a report on the U.S. electricity industry that doesn't decry the state of the nation's transmission grid." The consequences of failure to invest tens of billions in new infrastructure will be more frequent and ever-longer blackouts and brownouts, leading perhaps to electricity rationing and a host of fairly dire economic impacts.
- **Unavailability of sufficient investment capital.** Replacing infrastructure will require capital and political will. The current grid was built when energy was cheap, demand for electricity was lower, and the economy was growing at a rapid pace. Today investment capital is scarce, so the Federal government will have to pay for most of the grid upgrade. But the U.S. budget is already overextended in paying for bailout and stimulus packages, not to mention a couple of lingering wars. Until an unavoidable crisis arises, grid investment is likely to continue being moved back in the line of projects needing money.
- **Inability of the industry to maintain sufficient supplies of fossil fuels for electricity generation.** In my new book [\*Blackout\*](#), I discuss credible reports suggesting that U.S. coal production could peak in the years between 2020 and 2030 and decline afterward, with prices for the resource inevitably escalating. Natural gas seems plentiful for the time being, but continued exploration and production from new shale gas plays require high gas prices; further, problems with well productivity and low energy return on energy invested may render the new gas plays a mere flash in the pan.
- **Inability of alternatives to make up for fossil fuels.** If higher-priced and soon-to-be scarce coal and gas could be easily, quickly, and cheaply replaced with other energy sources, fossil fuel supply limits would pose no problem. However, all of the available alternatives are problematic in one way or another. Yes, we could have more wind, solar, geothermal, and tidal power—but it will take time and enormous amounts of investment capital (see above), and most of these alternatives are intermittent energy sources. (Post Carbon Institute and International Forum on Globalization have prepared a lengthy, soon-to-be published report, *Searching for a Miracle: "Net*

*Energy" and the Fate of Industrial Societies*, that examines 18 energy sources across 10 criteria, concluding that no combination of alternatives is likely to be able to replace fossil fuels within a reasonable time frame, and that therefore the world must rely on energy conservation as its primary strategy to deal with climate change as well as oil, coal, and gas depletion.)

- **Nuclear war.** The electromagnetic pulse generated by the explosion of hydrogen bombs has the capacity to fry the grid, and hundreds of millions of electrical devices plugged into it, nearly instantaneously. For war planners, this possibility is not only real and credible, it is one of the greatest causes of worry with regard to national survival following any nuclear exchange.
- **Systemic vulnerabilities.** We live in a world that is increasingly interconnected, and in which the pursuit of economic efficiency has reduced overall resilience. In such a system, problems in one area have a way of spilling over to create more problems elsewhere. For example, difficulties with oil supply will also eventually impact the electricity system, since spare parts and fuel (coal) for that system are made and/or transported with oil; similarly, problems with the electric grid will impact oil supply, since pumps and refineries require alternating current. Similarly, natural disasters, sabotage, social breakdown, and economic collapse could have knock-on effects (some too circuitous to predict) that would imperil continued, reliable delivery of electrical power.

What has to go right in order to avert grid breakdown? In many respects, this list could be a mirror image of the previous one:

- **Successful massive investments in grid upgrades.** As discussed above, these are far from being assured.
- **A rapid, successful conversion to alternative energy sources.** Again, as mentioned above, this is a long shot at best.
- **Averting of international conflicts that might go nuclear.** So far, so good....
- **Averting of grid breakdowns due to natural disasters, etc., or rapid recovery from such problems.** Society has been able to do this for decades: even in the cases of hurricanes, earthquakes, and wars, recovery was usually rapid. But increasingly crises are becoming synergetic.

The breakdown of electricity supply systems is not just a matter of theory. In about 100 nations around the globe, supplies of power are already problematic. Consider just one example: the nuclear-armed nation of Pakistan. Here is a quote from an [article](#) posted earlier this year on the website All Things Pakistan:

*While rolling blackouts or load shedding as its locally known has always been a staple of daily life in Pakistan, the problem has become acute in the last couple of years. In the second half of December, the situation got so bad that WAPDA & KESC (power generation entities in Pakistan) resorted to draconian levels of load*

*shedding. The power cuts during this time amounted to 20-22 hours a day in most small cities and even cities like Karachi were seeing 18+ hours of load shedding.*

Pakistan is a poor, politically unstable country; surely nothing like this could ever happen in a wealthy industrial nation! Yet consider the situation in Britain: a recent article in the *Telegraph* was headlined, "[Britain Heading Back to the Dark Ages](#)." The UK is facing a tipping point over the next few years in its ability to generate enough power to satisfy an ever-increasing demand." The article notes: "Over the next 10 years, one third of Britain's power-generating capacity needs to be replaced with cleaner fuels, as a result of European laws on pollution. By 2025 the situation is expected to worsen...." Another article, this one from the BBC, is titled, "[Britain Could Face Blackouts by 2016](#)"; it quotes David MacKay, a researcher at Cambridge University and soon-to-be government energy advisor, as saying, "The scale of building required [to avert blackouts] is absolutely enormous."

Generating electricity is not all that difficult in principle; people have been doing it since the 19th century. But generating power in large amounts, reliably, without both cheap energy inputs and secure availability of spare parts and investment capital for maintenance, poses an increasing challenge.

To be sure, here in the U.S. the lights are unlikely to go out all at once, and permanently, any time soon. The most likely scenario would see a gradual increase in rolling blackouts and other forms of power rationing, beginning in a few years, with some regions better off than others. After a while, unless governments and utilities could muster the needed effort, electricity might increasingly be seen as a luxury, even a curiosity. Reliable, ubiquitous, 24/7 power would become just a dim memory. If the challenges noted above are not addressed, many nations, including the U.S., could be in such straits by the third decade of the century. In the best instance, nations would transition as much as possible to renewable power, maintaining a functioning national grid or network of local distribution systems, but supplying rationed power in smaller amounts than is the currently the case. Digitized data would still be retrievable part of the time, by some people.

In the worst instance, economic and social crises, wars, fuel shortages, and engineering problems would rebound upon one another, creating a snowballing pattern of systemic failures leading to permanent, total blackout.

It may seem inconceivable that it would ever come to that. After all, electrical power means so much to us that we assume that officials in charge will do whatever is necessary to keep the electrons flowing. But, as Jared Diamond documents in his book *Collapse*, elites don't always do the sensible thing even when the alternative to rational action is universal calamity.

Altogether, the assumption that long-term loss of power is unthinkable just doesn't stand up to scrutiny. A permanent blackout scenario should exist as a contingency in our collective planning process.

### *Remember Websites?*

Over the short term, if the power were to go out, loss of cultural knowledge would not be at the top of most people's lists of concerns. They would worry about more mundane necessities like refrigeration, light, heat, and banking. It takes only a few moments of reflection (or an experience of living through a natural disaster) to appreciate how many of life's daily necessities and niceties would be suddenly absent.

Of course, everyone did live without power until only a few generations ago, and hundreds of millions of people worldwide still manage in its absence. So it is certainly possible to carry on the essential aspects of human life sans functioning wall outlets. One could argue that, post-blackout, there would be a period of adaptation, during which people would reformulate society and simply get on with their business—living perhaps in a manner similar to their 19th century ancestors or the contemporary Amish.

The problem with that reassuring picture is that we have come to rely on electricity for so many things—and have so completely let go of knowledge, skills, and machinery that could enable us to live without electrical power—that the adaptive process might not go well. For the survivors, a 19th century way of life might not be attainable without decades or centuries spent re-acquiring knowledge and skills, and re-inventing machinery.

Imagine the scene, perhaps two decades from now. After years of gradually lengthening brownouts and blackouts, your town's power has been down for days, and no one knows if or when it can be restored. No one is even sure if the blackout is statewide or nationwide, because radio broadcasts have become more sporadic. The able members of your community band together to solve the mounting practical problems threatening your collective existence. You hold a meeting.

Someone brings up the problems of water delivery and wastewater treatment: the municipal facilities require power to supply these essential services. A woman in the back of the room speaks: "I once read about how you can purify water with a ceramic pot, some sand, and charcoal. It's on a website...." Her voice trails off. *There are no more websites.*

The conversation turns to food. Now that the supermarkets are closed (no functioning lights or cash registers) and emptied by looters, it's obviously a good idea to encourage backyard and community gardening. But where should townspeople get their seeds? A middle-aged gentleman pipes up: "There's this great mail-order seed company—just go online...." He suddenly looks confused and sits down. *"Online" is a world that no longer exists.*

### *Is There Something We Should Be Doing?*

There is a message here for leaders at all levels of government and business—obviously so for emergency response organizations. But I've singled out librarians in this essay because they may bear the

gravest responsibility of all in preparing for the possible end of electric civilization.

Without widely available practical information, recovery from a final blackout would be difficult in the extreme. Therefore it is important that the kinds of information that people would need are identified, and that the information is preserved in such a way that it will be accessible under extreme circumstances, and to folks in widely scattered places.

Of course, librarians can never bear sole responsibility for cultural preservation; *it takes a village*, as Hillary Clinton once proclaimed in another context. Books are clearly essential to cultural survival, but they are just inert objects in the absence of people who can read them; we also need skills-based education to keep alive both the practical and the performing arts. What good is a set of parts to the late Beethoven string quartets—arguably the greatest music our species has ever produced—if there's no one around who can play the violin, viola, or cello well enough to make sense of them? And what good would a written description of horse-plowing do to a post-industrial farmer without the opportunity to learn hands-on from someone with experience?

Nevertheless, for librarians the message could not be clearer: Don't let books die. It's understandable that librarians spend much effort trying to keep up with the digital revolution in information storage and retrieval: their main duty is to serve their community *as it is*, not a community that existed decades ago or one that may exist decades hence. Yet the thought that they may be making the materials they are trying to preserve ever more vulnerable to loss should be cause for pause.

There is a task that needs doing: the conservation of essential cultural knowledge in non-digital form. This task will require the sorting and evaluation of information for its usefulness to cultural survival—triage, if you will—as well as its preservation. It may be unrealistic to expect librarians to take on this responsibility, given their existing mandate and lack of resources—but who else will do it? Librarians catalog, preserve, and make available accumulated cultural materials, especially those in written form. That's their job. What profession is better suited to accept this charge?

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The contemplation of electric civilization's collapse can't help but provoke philosophical musings. Perhaps cultural death is a necessary component of evolution—as is the death of individual organisms. In any case, no one can prevent culture from changing, and many aspects of our present culture arguably deserve to disappear (we each probably carry our own list around in our head of what kinds of music, advertising messages, and television shows we think the world could do without). Assuming that humans survive the current century—by no means a sure thing—another culture will arise sooner or later to replace our current electric civilization. Its co-creators will inevitably use whatever skills and notions are at hand to cobble it together (just as the inhabitants of Europe in the Middle Ages and the Renaissance drew upon cultural flotsam from the Roman Empire as

well as influences from the Arab world), and it will gradually assume a life of its own. Still, we must ask: *What cultural ingredients might we want to pass along to our descendants? What cultural achievements would we want to be remembered by?*

Civilization has come at a price. Since the age of Sumer cities have been terrible for the environment, leading to deforestation, loss of topsoil, and reduced biodiversity. There have been human costs as well, in the forms of economic inequality (which hardly existed in pre-state societies) and loss of personal autonomy. These costs have grown to unprecedented levels with the advent of industrialism—civilization on crack—and have been borne not by civilization's beneficiaries, but primarily by other species and people in poor nations and cultures. But nearly all of us who are aware of these costs like to think of this bargain-with-the-devil as having some purpose greater than a temporary increase in creature comforts, safety, and security for a minority within society. The full-time division of labor that is the hallmark of civilization has made possible science—with its enlightening revelations about everything from human origins to the composition of the cosmos. The arts and philosophy have developed to degrees of sophistication and sublimity that escape the descriptive capacity of words.

Yet so much of what we have accomplished, especially in the last few decades, currently requires for its survival the perpetuation and growth of energy production and consumption infrastructure—which exact a continued, escalating environmental and human toll. At some point, this all has to stop, or at least wind down to some more sustainable scale of pillage.

But if it does, and in the process we lose the best of what we have achieved, will it all have been for nothing?

## **2. Is the Global Oil Tank Half-Full, Is It Half-Empty ...or Are We Running on Fumes?**

In his article in the *New York Times* September 24, "[Oil Industry Sets a Brisk Pace of New Discoveries](#)", staff reporter Jad Mouawad cites oil discoveries totaling ten billion barrels for the first half of 2009. The Tupi field in the Gulf of Mexico alone accounts for four billion barrels of crude that may eventually find its way into the world oil system. Indeed, this year has seen discovery results that could end up being the best since 2000. But, the article notes, the new oil was expensive to find, it will be expensive to extract, and both exploration and production are only possible because of high levels of investment and sophisticated, expensive new technologies.

To justify the needed level of effort, the oil industry requires prices in excess of \$60 per barrel, according to Mouawad; otherwise, the new projects will turn out to be money-losers. Some analysts believe the magic break-even number is closer to \$70. In any case, the figure is much higher than was required only a few years ago, and still-higher prices may be necessary to make exploration and production profitable for future projects—prices perhaps close to \$80.

According to Mouawad, "While recent years have featured speculation about a coming peak and subsequent decline in oil production, people in the industry say there is still plenty of oil in the ground, especially beneath the ocean floor, even if finding and extracting it is becoming harder." So the new discoveries presumably indicate that peak oil has been delayed, and that our concerns about the event have been misplaced.

Yet this would be a strange conclusion to draw from the facts cited, for two reasons.

First: The ten billion barrels of new discoveries reported so far do initially sound encouraging: if the second half of 2009 is as productive, that means a total of 20 billion barrels of new oil will eventually be available to consumers as a result of discoveries this year. But how much oil does the world use annually? In recent years, that amount has hovered within the range of 29-31 billion barrels. Therefore (assuming continued good results throughout 2009), in its most successful recent year of exploration efforts, the oil industry will have found only two-thirds of the amount it extracted from previously discovered oilfields.

When the "ten billion barrels" figure is framed this way, its "gee whiz" shimmer quickly fades. (Yes, the article discusses the phenomenon of "reserve growth," which is supposed to render the pace of new discoveries less important—but that red herring has been exposed plenty of times, including [here](#).) *The Times* article hints that 2009's high discovery rate may be the beginning of a new trend, so that we may see even better rates in future years; but remember, that hypothetical outcome hinges on a crucial factor—increasing investment in exploration and production—which leads us to a second critical thought.

The staggering levels of investment that enabled drilling in miles of ocean water, so as to achieve the 2009 finds, were occasioned by historic petroleum price run-ups from 2004 to 2008—with prices eventually spiking high enough to cripple the auto industry, the airlines, and global trade. As petroleum prices climbed ever higher, oil companies saw sense in drilling test wells in risky, inhospitable places. But in recent decades oil price spikes have repeatedly triggered recessions. And clearly, as we all discovered rather forcibly last year, the global economy cannot sustain an oil price of \$147 a barrel: as the economy crashed in the latter months of 2008, so did oil demand and oil prices (which hit a low in December-January near \$30).

So, what *is* a sustainable price? A review of recent economic history yields the observation that when petroleum sells above about \$80 a barrel (in inflation-adjusted terms) the economy begins to stall. Oil industry wags have begun to speak of a "Goldilocks" price range of \$60 to \$80 a barrel (not too high, not too low—just right!) as the prerequisite for economic recovery ([For OPEC, Current Oil Price Is Just Right](#)). If prices are higher, the economy sputters, reducing oil demand and subsequently seriously undermining prices; if they drift lower, not enough investment will go toward exploration and production, so that oil shortages and price spikes will become

inevitable a few years hence (indeed, since the oil price crash of late 2008 over \$150 billion of investments in new oil projects have been cancelled). If the market can keep prices reliably within that charmed \$60 to \$80 range, all will be well. Too bad that petroleum prices have grown extremely volatile in recent years: we must hope and pray that trend is over (though there's no apparent reason to assume that it is).

Let me summarize: the industry needs oil prices that are both stable and near economy-killing levels in order to justify investments necessary to *possibly* replace depleting reserves and overcome declining production in existing oilfields (I say "possibly" because we have insufficient evidence as yet to conclusively show that new discoveries enabled by expensive new exploration and production technologies can offset declines in the world's aging giant oilfields).

Should this picture lead the viewer to come away with reassured thoughts of "No worries, happy motoring?" Or does this look more like a portrait of peak oil?

Several commentators (including analysts with financial services company Raymond James Associates and Macquarie, the Australian-headquartered investment bank) have concluded from recent petroleum statistics that global oil production peaked in 2008. Macquarie is saying that world production *capacity* is peaking *this year*, which is a nuanced way of saying the same thing, since currently production is constrained more by depressed demand than by immediate shortfalls in supply; in effect both organizations assert that the world will never see higher rates of extraction than the so-far record level of July 2008.

I see nothing in the recent discovery data that should call that conclusion into doubt.