

# Civilizing the Electronic Frontier

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*Dateline Pittsburgh, summer 2065. Athena, a young assistant professor at Carnegie Mellon E-versity turns away from planning the transmedia concept visualization challenge for her entering students and picks up the memo from the Dean of Students about the Beloit Mindset List for these students*

**For students entering college in fall of 2065...**

...they have never manually operated an auto  
...useful work at decent wages is always available  
...they never wrote a "line of code"; most never will  
...they have never worried about identity theft

...there have always been personalized medical diagnoses & pharmas  
...they have never truly been alone and out of touch  
...most have never held a "book", a "coin", a "keyboard", or a "mouse"  
...information transparency means they have rarely been cyberbullied

*"What was the Beloit Mindset knowledge for freshmen 50 years ago?" she asks the memex. The reply ...*

**For students entering college that fall...**

...they meet friends on Skype, not in the park  
..."Salon" has always been an online magazine  
..."press pound" is now translated "hit hashtag"  
..."good feedback" is 30 Facebook likes in a day

...rates of diagnosed diabetes have always been rising  
...since they binge-watch TV shows, they may binge-watch courses  
...there has always been a database of sex offenders  
...courts have always been overturning same-sex marriage laws

*"Were those even things? How did we get from then to now?" she reacts, and invokes Gra, her favorite grandparent, through ScientificSéance, which generates synthetic interviews by not only mining the historical record but also by inferring what the speaker would have said in context. A hologram appears ...*

Hi, Athena! What's happening at your end of the 21<sup>st</sup> century?

Hi, Gra, you were a young prof at Carnegie Mellon in 2015. Look at the differences between the common knowledge of entering students in your day and mine! What are these things – Skype, magazine, hashtag, diabetes, TV? How in the universe did we get to now?

A lot has changed, Athena. By 2015, the electronic frontier pervaded nearly all areas of life – communication, commerce, entertainment, government ... but online life was still wild and woolly, as it is on any frontier. We were feeling our way through the new terrain, led by eccentrics, entrepreneurs, and other early settlers. We valued independence and self-sufficiency, and we distrusted authority (both civil and scientific). Computing provided leverage to perform what had once been isolated actions at dangerous speed and scale. We were developing the sorts of public amenities and expectations that come with civilization, but problems of dependability, jurisdiction, and effective governance left us with vandals, imposters, cyberthieves, and bullies. It was great if you had computing skills, very scary if you didn't.

Was frontier life pretty risky, with unreliable systems and easy ways to evade responsibility?

Things got pretty bad for a while. Automation took over not only physical but also mental tasks and drove more and more people out of jobs; the race for lowest prices regardless of quality got fiercer; and the concentration of wealth was awful – 1% of the population held half of the world's wealth. I thought we were headed for one of those post-apocalyptic dystopias that filled so many movies. But the cataclysmic events of the '30s led to the Great Upheaval of the '40s in which we rejected grotesque wealth inequality; reset corporate responsibility to serve employees, clients, and community as well as profit; and established the jurisdiction of law for the internet, especially with respect to use of personal information, ownership of intellectual property, and attribution of actions.

Automation is still widespread, mostly for tedious, unsafe tasks. But we value many things more than just the bottom line, so it isn't pervasive. How did you civilize the electronic frontier?

Largely, a new shared sense of rights and responsibilities – the big result of the Great Upheaval was rejecting intense concentrations of power. But also dependable infrastructure; open access to social amenities for health, knowledge, and entertainment; and enforcement of shared norms. This required immense social and political change. We were already recognizing the problems in 2015, but we did not have the will to act until the Great Upheaval. It took technology to make this work, though. For example, after it became impossible to protect access to information by technical means, the Moore's Law increases in the ability to handle metainformation allowed us to enact strict regulations on the way information is used, not on whether it is accessible. This created visibility that exposed the sources of abuse -- anyone can invoke an audit, and penalties are severe. This allowed enforcement of the new community standards of the Great Upheaval: crimes like corruption and espionage became visible and hence punishable; corporate and personal greed became detectable; and exploitation of personal information became as unacceptable as sexual assault – socially beyond the pale. This led to a period that was nearly Victorian in its probity.

But more than one person may have an right to information – for example, in cases of genetic disease risk my ancestors' genetic data affects me personally, and I also have an interest in knowing what's in the proprietary witch's brew the factory next door is putting in the drinking water. We recently developed models of shared ownership interest in knowledge and ways to enforce the balance of interests among the owners. In this culture, it's absolutely unthinkable to pry into personal details beyond expressly permitted uses. We still haven't solved the problem of appropriate anonymity, but at least we can produce content that's explicitly anonymous, which people can then evaluate on its merits rather than the author's reputation.

Last time we talked, you had just been diagnosed with cancer. How is that going?

It's all good now. The docs analyzed the tumor plus our family genomes (thanks for putting yours in trust!) and designed a tumor-specific drug, plus some nanophages to clean up the cellular debris. I felt lousy for a week, but I'm fine now. Oh, you recall that Apollo lost a hand in that RubeGoldBerg race? The neural control of his prosthesis has settled down, and now you can scarcely tell he's using one – except when he ideates a specialized gripper for some task. There's no question of suing anyone, of course, the accident was his own fault; we now have more engineers than lawyers and take personal responsibility seriously.

It's late summer, you must be planning your fall class. Will the students use MOOCs?

Oh, Gra! "Class" is so last-century! And, while MOOCs were big improvements over textbooks, they don't begin to address real education. We do "educational challenges" now – they learn established content online, and the E-versity provides personal coaching on how to build on that content. While most of my new students are about 18, like yours were, many have followed their own life paths and come when they are ready. Anyhow, I'm setting up an easy exercise in which they visualize and manipulate knowledge bases on the new G-major platform. This allows each student to pick some personal and public datasets, sketch some desired views, refine those into a precise definition, and do systematic design for the realization. Thanks to our ability to fully specify and verify the elements and their interactions, students can make early predictions about cost, accuracy, performance, and flexibility of the system, then use this analysis to select elements from the open marketplace. Interoperability problems have been negotiated away, so students can go directly to realization with confidence that failures will result from their own decisions about the composition rather than from defects in parts or connection protocols.

How did you get third-party vendors to give up enough knowledge to get that level of confidence?

That's also fallout from the Great Upheaval. The US went back to the original constitutional model of intellectual property – a time-limited monopoly in exchange for disclosing the IP and

putting it in the public domain after a reasonable time. This was a huge boon to creativity. In addition, the G-major system integrates what you used to call programming into higher-level – architectural – aspects of design. Making precise descriptions is what matters now, not coding.

That’s a huge shift from my day, both in the education and in software. What will you do after that?

After getting some proficiency with the G-major integration platform, our next experience will be to develop audits of the uses of their personal information and online possessions to flag abuse and file complaints. After that, we’ll turn to something aesthetic – probably an integrated performance that incorporates people and machines in many different locations. The performance augmentation software has allowed vastly more people to do credible live performances, just as even the earliest Adobe software allowed people without painting skill to create inspired visuals. This matters to students, because most ordinary production of goods has been automated, so jobs and rewards are largely for aesthetic and individualized activity, and reputation is as important as money. Thanks to information transparency, their contributions and the impact of their work can be tracked and rewarded.

Will they publish their results?

They’ll disseminate, of course. Your old style of writing up individual increments to knowledge and expecting the reader to synthesize them was so quaint! We focus on presenting an integrated corpus of results – rather like your software systems with evolving releases. Metainformation allows others to reference and review increments in context; it enables collaboration; and it tracks dependencies so we can see and get credit for the way the work is used and get suitable credit. Your habit of counting citations was like printing money; we track real impact now

I’m amazed by the restraint and level of transparency you have, plus the richer reward structure.

A lot changed when we realized “just because you can, doesn’t mean you should”. Bye, Gra’, till next time.

## Notes

1. Yes, the *Beloit Mindset List* is a thing. Beloit College created it initially to remind faculty “to be wary of dated references [and it] quickly became a catalog of the rapidly changing perception of each new generation.” See the lists back to 2002 (“there has only been one Pope”; “Star Wars looks fake with pathetic special effects”) at <http://www.beloit.edu/mindset/>. The list highlights some important transitions of the past 15-20 years, which makes it useful here. Of course, I ad-libbed the list for students starting in 2065 – Beloit hasn’t gotten around to it yet ☺
2. “Dean of Students”: some things never change
3. The concept of frontier in play here is similar to Turner’s Frontier Thesis, which shaped American views of our frontier as well as popular treatments in movies, novels, etc.
4. This is a technical foretelling, not a social, political, or economic one. It’s frankly optimistic, and it depends on some societal changes. There isn’t space here to explain how this change could happen, so I buried it in some unspecified event that takes place in 2015’s future and 2065’s past. The essence of fiction is willing suspension of disbelief on the part of the reader – so just go with the flow, ok?
5. Wealth and income inequality: There are lots of indicators and sources for this. For example, <http://fivethirtyeight.com/datalab/meet-the-80-people-who-are-as-rich-as-half-the-world/> reports that in March 2014, 80 people held as much wealth as the poorest 50% of the world’s population. Oxfam analysis reported at <http://www.bbc.com/news/business-30875633> says the richest 1% of the world’s population controls 48% of its total wealth and it takes net worth of just over half a million to be part of the 1%.
6. Yes, I’m ignoring climate change, rampant anti-intellectualism, gun control, religious extremism, racism, outer space, world hunger, the threat that AI will make humans irrelevant, and any number of other forces that could radically change the future. Chill, it’s just three pages.