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This month's MuseLetter brings three new essays. The first explores human aging as a metaphor for societal decline. Next up is a look at the importance of art and creativity in post-growth society. We finish with a takedown of some creative forecasting on oil and gas production by the EIA.

Old Age and Societal Decline

People grow old and die. Civilizations eventually fail. For centuries amateur philosophers have used the former as a metaphor for the latter, leading to a few useful insights and just as many misleading generalizations. The comparison becomes more immediately interesting as our own civilization stumbles blindly toward collapse. While not the cheeriest of subjects, it's worth exploring.

A metaphor is not an explanation.

First, it's important to point out that serious contemporary researchers studying the phenomenon of societal collapse generally find little or no explanatory value in the metaphorical link with individual human mortality.

The reasons for individual decline and death have to do with genetics, disease, nutrition, and personal history (including accidents and habits such as smoking). We are all genetically programmed to age and die, though lifespans differ greatly.

Reasons for societal decline appear to have little or nothing to do with genetics. Some complex societies have failed due to invasion by foreign marauders (and sometimes the diseases they brought); others have succumbed to resource depletion, unforeseeable natural catastrophe, or class conflict. Anthropologist Joseph Tainter proposed what is perhaps the best general theory of collapse in his 1988 book *The Collapse of Complex Societies*, which argued that the development of societal complexity is a problem-solving strategy that's subject to diminishing marginal returns. Once a civilization's return on investment in complexity goes negative, that civilization becomes vulnerable to stresses of all sorts that it previously could have withstood.

There is a superficial similarity between individual aging, on one hand, and societal vulnerability once returns on investments in complexity have gone negative, on the other. In both cases, what

would otherwise be survivable becomes deadly—whether it’s a fall on an uneven sidewalk or a barbarian invasion. But this similarity doesn’t provide explanatory value in either case. No physician or historian will be able to do her job better by use of the metaphor.

Nevertheless, as long as we don’t fall into the trap of seeing it as an explanation, the comparison may still be useful. Explanation isn’t everything. We naturally want to know how to deal mentally and emotionally with both personal and societal mortality, and it’s in this pursuit that we may find usefulness in the metaphor.

Is the world getting old, or is it just me?

In order to locate that usefulness it’s probably best to start by acknowledging our context. Our own civilization is circling the drain. I won’t bore readers already well versed in the literature by rehearsing evidence that modern industrial society is past its sell-by date. For those new to the discussion, perhaps the most concise text I can recommend is William Ophuls’s tiny book, [*Immoderate Greatness: Why Civilizations Fail*](#). Ophuls surveys the best previous writings on the subject and offers a summary of the stages through which every civilization seems to pass on its inexorable journey toward collapse. It’s up to the reader to decide at which stage our own civilization has arrived.

Those of us who have spent years or decades drinking from the well of ecological literature on climate change, resource depletion, species extinctions, and limits to growth need no reminder of the existential threats to our society. The global industrial civilization that currently supplies us with everything that is necessary for life is coming apart—politically, socially, economically, and ecologically. Our leaders are incapable of acknowledging, much less reversing, industrial society’s progress toward oblivion.

This realization can be as at least as devastating as that of our personal mortality, though only for those who actually pay attention to the warning signs and have a historical perspective regarding past instances of collapse. (We haven’t talked about a third level of death—the extinction of the human species. This is eventually inevitable, but it obviously hasn’t ensued from previous civilizational crises, and probably won’t do so this time around either. Very few people give this ultimate mortality any thought whatsoever.)

Personal mortality is harder to deny than societal or species mortality. It’s true that, when we’re young, we know theoretically that our lifespan will be limited, yet somehow that knowledge tends not to sink in. But then, as decades pass and as we see ourselves age, our parents die, and our friends disappear one by one, death gradually becomes a constant if unwelcome companion. If we’re practical, we make plans for old age and write a will. If not, we may persist in denial, living as though nothing will ever change. But even then, moments when denial is impossible become more frequent. And in those moments the awareness of mortality is an inescapable psychological burden. However happy, unhappy, fulfilled, unfulfilled, privileged, underprivileged, eventful, or boring our life is and has been, it is in any case fleeting. In a few years our personal window into the world will no longer exist.

If it is mostly older people who viscerally understand and grapple with mortality, it may also be the deeply mature who are more likely to contemplate societal decline. At environmental lectures it's hard not to notice that the average age of audience members tends to be 50 and above. That's not to say there are no young people who understand that our civilization is fragile and self-destructive. In fact, some of the most knowledgeable and dedicated environmental activists I know are in their twenties and thirties. Perhaps most in their age cohort are simply too busy just getting by to bother attending lectures.

Is there a natural tendency for old people to yearn for the good old days and to complain that the world is going to hell? Certainly it is possible to think of examples of the stereotype—from biblical prophets like Jeremiah to elderly contemporary environmental writers such as Paul Ehrlich. But the key authors of *The Limits to Growth* were in their twenties when the book was released, as was Bill McKibben when he penned his bombshell *New Yorker* articles about climate change, which became the bestselling book *The End of Nature*. And Paul Ehrlich was only 35 when *The Population Bomb* was published.

Further, in traditional societies the role of elders was not so much to foresee calamity as to offer guidance and encouragement to younger people, in return for which they earned respect. Perhaps it's only in societies that are at risk of decline and collapse, and in which the traditional role of elders is largely unacknowledged and unfilled, that old codgers tend to turn prophetic.

It's the end of the world but I feel . . . how?

Nevertheless, our relative personal age may tend to make us feel somewhat differently about the end of civilization.

Young people are naturally concerned with career, partnering, reproduction, and parenting. They are likely to regard information about dire environmental trends as a distraction from these genetically and socially driven interests. Their incentive for denial is strong. Optimism sells: it helps one get ahead in the job market and it's attractive to potential mates. However, if denial is overcome for whatever reason, a young person is likely to feel that societal decline is something she or he will personally have to deal with. One response might be to engage in activism to counter trends leading toward collapse; another would be to spend time and effort developing skills that are likely to be useful in a society that is downsizing and simplifying.

Older people are naturally more concerned with personal maintenance (failing vision and hearing, failing joints, failing memory). They want to ensure that they have made some lasting contribution to community and extended family. Though there are plenty of elderly activists, on the whole the attitude of the aged toward societal decline tends to be more that of an observer: there is the belief that although the world is going to hell, I personally will be gone by the time that destination is reached. Nevertheless it's my duty to tell everyone who will listen what I think is happening and why.

Often, when denial of societal decline is no longer tenable, young and old alike jump straight to cynicism. Here I am not referring the teachings of the ancient Cynic philosophers such as Diogenes, which had many good points, but to the modern meaning of the term—which refers to concern only with one's own interests, and the belief that society is inherently corrupt and irredeemable. Cynicism offers some minimal psychological self-immunization to utter despair, but this comes at the expense of connection with others—which is an essential ongoing source of emotional vitality.

Those who get beyond denial and cynicism often arrive at an attitude of compassionate engagement. We may not be able to prevent collapse, but we can still make life better for ourselves and other potential survivors as events unfold. We can make our community more resilient, protect vulnerable people and other creatures, and devote ourselves to creating places and moments of beauty.

May we have a good death; civilization too.

We each wish to die painlessly and well, with dignity, with our faculties intact, and with loved ones close by. It often doesn't work out that way. But there are things we can do to improve our odds, such as to eat carefully, exercise, and treat others with respect and generosity.

What would a good civilizational death look like? It would be relatively slow rather than sudden; the distance of the fall would be manageable (people would be able to adjust to the reduction in societal complexity); and the casualties would be few. In the best instance, the death of a civilization is merely the "release" phase of [the adaptive cycle](#), clearing the way for new growth of more diverse, simpler human cultures.

Achieving a "good" civilizational death would entail minimizing damage to ecosystems and exhaustion of natural resources, so that human survivors would have the biophysical basis for recovery. It would also require minimizing human births prior to collapse so as both to conserve resources and reduce the sum total of human suffering during the decline and fall, since collapse always entails a reduction in carrying capacity.

Sadly, a good individual death is easier to achieve than a good civilizational death: personally, we have a wide range of behavioral choices, whereas great civilizations are denial machines that, at least in their latter stages of development, always reward excess and penalize modest sufficiency. Civilizations grow as big as they possibly can, given their energy sources, their technologies, and the available ecological bounty. And ours has grown the biggest of all as a result of having fossil fuels as energy supplies.

Nevertheless, our personal choices make a difference for ourselves and for those in widening circles around us, potentially expanding our survival and recovery options within a civilization whose overall trajectory toward dissolution is already set. By pursuing sufficiency in the face of excess, conservation of the natural world, and connection with others, we can have as good and meaningful a life as possible

within a civilization that is both itself dying, and dealing death to creatures great and small.

These are not entirely new thoughts. Joanna Macy has for years sounded many of the themes explored above in her ["Work that Reconnects."](#)

Carolyn Baker does the same in her book [Collapsing Consciously: Transformative Truths for Turbulent Times](#). And [The Dark Mountain Project](#) pursues "uncivilization" as a collective creative project, having acknowledged that "It is . . . our civilisation's turn to experience the inrush of the savage and the unseen; our turn to be brought up short by contact with untamed reality." The effort to seek and provide hospice care for the inhabitants of a dying civilization is never likely to go viral on social media or spark a movement. But it makes as much sense as any other activity I can think of.

According to tradition, the Buddha's awakening began with his realization that sickness, old age, and death are inevitable. Perhaps our own realization that civilization's demise is just as certain can lead to still another level of awakening.

Here the metaphor may show its highest usefulness. Old age teaches us the preciousness of everything—friends, nature, and ordinary moments in ordinary days. Truly ancient people, aged 85 and above, often attain a level of happiness that belies their physical frailty.

Maybe a society that's on the verge of collapse provides the perfect incubator for an experience of reassessment, reconnection, and renewal. Whatever time we have left is valuable beyond measure. Let's make the most of it.

As Climate Changes, We Need the Arts More than Ever

Article originally posted at [Ensia](#).

In tumultuous times, art can and must express the turmoil and help us process what's going on.

What role might the arts play in response to climate change and related economic and ecological crises?

In the 1997 film "Titanic," Wallace Hartley, the violinist and leader of the band on the ill-fated ship, turns to his band mates as the water rises around him and says: "Gentlemen, it has been a privilege playing with you tonight." Is the only contribution musicians and other artists can make at this moment in history to bravely go down with the ship, lifting the spirits of fellow passengers? On its own terms that's an honorable contribution, but surely we can do more.

It's often said that a novel, a painting, a song or a motion picture changed the world. What that really means is, it changed how a lot of people thought or felt about the world.

Anthropologists and historians rightly argue that society's major transformations have emerged not from the arts, but from our

relationship to our environment — for example, our shift from hunting and gathering to agriculture, or from using firewood as our main energy source to using fossil fuels.

Nevertheless, artists' efforts help shape the terms by which society adapts to such transformations and their consequences. And this can be a big deal. Think of how Beethoven marked the beginnings of modern democracy, the Romantic Movement in poetry and philosophy, and the nascent Industrial Revolution with music that shattered the aristocratic formalism of previous generations. Or how Hollywood writers and directors galvanized massive support for the U.S. war effort during the early 1940s.

Now think ahead.

We have embarked on a century in which the societal systems built since the start of the Industrial Revolution — our food system, our transport systems, our energy system, our built environment, our financial system, and possibly our political and governance systems as well — will prove unsustainable. All were designed during an era in which fossil fuels met the great bulk of our fast-growing energy demand. Cheap, abundant, and easy to store and transport, these fuels facilitated long-distance transportation, and hence centralized, globalized systems of production and distribution. Economic growth would probably never have become the organizing principle of politics and society if we had never started burning coal, oil and natural gas.

But fossil fuels are exhaustible resources, and their depletion will drive evermore desperate methods of extraction, create evermore environmental risk and require ever more capital — even as alternative energy sources also demand far more investment. The economic and political implications are barely fathomable.

Everything will be up for negotiation, redesign and change. Further, burning fossil fuels changes our planet's climate. So, at the same time our economy will need to be redesigned to run on entirely different energy sources, the natural world will be shifting around us in unprecedented ways, with more frequent catastrophic storms, floods and droughts. Sea level will rise. Cities will be forced to move to higher ground. Whole populations will migrate toward the poles and inland.

And artists will have the opportunity and duty to translate the resulting tumultuous human experience into words, images, and music that help people not just to understand these events mentally, but also to come to grips with them viscerally.

The economic and environmental shifts described above are currently being detailed in ever-greater specificity in hundreds of reports released yearly by climate and energy experts — though in terms the average person struggles with. What's missing in their carefully worded journal articles are the human dimensions of imagination, joy or sorrow, inspiration, and passion. No wonder so many of us simply deny their message or tune it out.

Art can help us cope with the implications of our collective challenges. It can help prepare society for a possibly traumatic future. It can give

voice to suffering and loss, helping people deal with life's inevitable stress. And it can also offer beauty, which can be especially important in hard times.

Of course, to be good, art has to succeed in terms of structure, skill, insight and originality. Bad art with a valid social message is still bad art, and it will take far more than just an increase in the number of climate change-themed TV series, movies, operas, dystopian novels, county-western songs, art installations, hip-hop verses, and performance pieces to show us the way. Artists will need to dig deeper, observe more closely and help their audiences connect abstract explanations and forecasts with concrete experiences.

As we move closer to what surely will be unprecedented ecological, economic and social disruption, meaningful art can and must express the turmoil we encounter and help us process it intellectually and emotionally.

In this sense, our need for truly great artists has never been keener.

EIA: U.S. Energy Abundance for Now— But Don't Peek Behind That Curtain!

The Energy Information Administration (EIA) of the U.S. Department of Energy is about to release its *Annual Energy Outlook (AEO) 2018*, with forecasts for American oil, gas, and other forms of energy production through mid-century. As usual, energy journalists and policy makers will probably take the document as gospel.

That's despite the fact that past AEO reports have regularly delivered forecasts that were seriously flawed, as [the EIA itself has acknowledged](#). Further, there are analysts inside and outside the oil and gas industry who crunch the same data the EIA does, but arrive at very different conclusions.

The last few EIA reports have displayed stunning optimism regarding future U.S. shale gas and tight oil production, helping stoke the notion of U.S. "energy dominance." No one doubts that fracking has unleashed a gusher of North American oil and gas on world markets in the past decade. But where we go from here is both crucial and controversial.

The most comprehensive critiques of past AEO forecasts have come from earth scientist David Hughes, a Fellow of [Post Carbon Institute](#) (note: I, too, am a Post Carbon Institute Fellow). Since 2013, Hughes and PCI have produced annual studies questioning EIA forecasts, based on an analysis of comprehensive play-level well production data. Their latest report, a critical look at AEO2017, is just out.

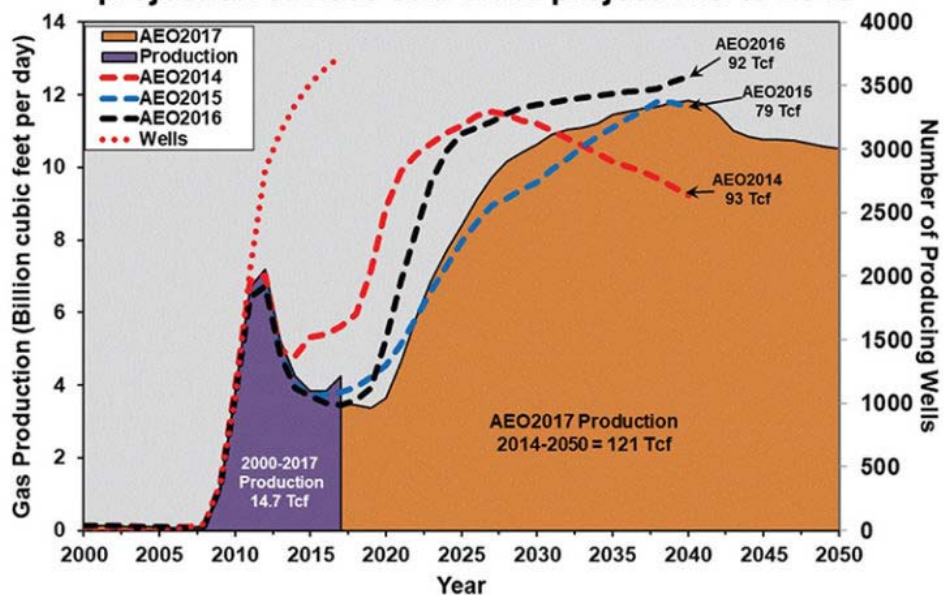
["Shale Reality Check: Drilling Into the U.S. Government's Rosy Projections for Shale Gas & Tight Oil Production Through 2050"](#) explores four big questions crucial to the realization of the EIA's forecasts:

- 1. How much of the industry's recent per-well drilling productivity improvement is a result of better technology, and how much is due to high-grading the**

best-quality parts of individual plays? Over the past few years, industry has shown the ability to extract increased amounts of oil and/or gas from each well. This has been achieved in part by drilling longer horizontal laterals, tripling the amount of water and proppant (usually sand) used per unit of well length, and increasing the number of fracking stages. It is also in part a result of “high-grading,” or focusing drilling on the best-quality parts of each play (termed “sweet spots” or “core areas”). The decline in average well productivity observed in parts of some plays, despite the application of enhanced technology, suggests that sweet spots there are becoming saturated with wells. When this happens, drillers must either move to lower-quality rock outside of sweet spots, or drill wells too close together, which results in well interference or “frac hits” and reduced well production.

2. **Can technological advancement in the industry continue to raise productivity indefinitely?** If, as the EIA suggests, improved technology will continue to increase well production, then perhaps per-well productivity can continue to grow for some time. However, based on the analysis of recent data, Hughes questions this ([as does a team of MIT researchers](#)). Well productivity is already declining in some plays, despite the application of enhanced technology, indicating that technology and high-grading have reached limits. Given uniform reservoir quality, improved technology allows the resource to be extracted more quickly with fewer wells, but it does not necessarily increase the overall amount of resource that can be recovered.
3. **What will be the ultimate cumulative production from all U.S. tight oil and shale gas wells?** Taking the above points into account, Hughes concludes from a detailed analysis of production data that the EIA is making extremely optimistic assumptions about ultimate production and long-term production rates in most shale plays. Production over the long term is likely to be a fraction of what the EIA is forecasting.

Haynesville Gas Production compared to the AEO2017 projection to 2050 and older projections to 2040



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(production data from Drillinginfo; EIA AEO2014, AEO2015, AEO2016 and AEO2017)

EIA AEO2017 reference case Haynesville Play production estimate through 2050. Also shown are earlier AEO estimates to 2040. The EIA expects production to rise to a new peak in 2040 of triple current production levels and exit 2050 at 2.5 times current levels. This would require recovering eight times as much gas by 2050 as the play has recovered to date and producing more gas by 2050 than the EIA's own estimates of proven reserves plus unproven resources.

4. **What about profitability?** So far, overall, [the industry has lost money](#) on tight oil production, and shale gas has done little better. That's even with most recent drilling being focused in core areas. The industry and its investors assume that if productivity continues to increase, and oil prices rise, profitability will eventually materialize. But what levels of oil and gas prices would be required to profitably extract fuels in the large non-core areas that the EIA assumes will eventually be tapped after "sweet spots" are drilled and exhausted? The AEO offers little in the way of realistic analysis on this point.

Let's approach this subject another way. If you were an EIA analyst and you wanted to produce the most optimistic estimate possible of future U.S. oil and gas production, how might you go about it? You might do the following:

- Mischaracterize the source of recent productivity improvements (assume it's mostly technology, not high-grading);
- Extrapolate recent well productivity improvements far into the future, even though evidence suggests this is unwise;
- Assume that large areas that are not currently being drilled will be highly productive; and
- Ignore price and profitability.

Check, check, check, and check.

Hughes figures, using EIA assumptions, that meeting the agency's projections for shale gas and tight oil through 2050 for the 88 percent of production that would come from major plays would

require drilling and fracking **over 1 million wells** at a cost of **\$5.7 trillion** (the remaining 12 percent would require .68 million wells at a cost of \$4.1 trillion). The EIA's own estimate for all oil and gas (conventional, shale and offshore) is 1.3 million wells at a cost of \$7.7 trillion. It would also consume countless billions of gallons of water and millions of tons of sand and chemicals. One might question the plausibility of this scale of expenditure of capital and physical resources. But even if the project were practically feasible, would it represent the best use of money in securing our energy future? And would the inevitable near- and long-term health and environmental impacts be somehow justified?

The EIA seems to assume that its audience consists of potential investors in struggling tight oil and shale gas companies, and that it speaks on behalf of those companies. That's not the proper role of a government agency. Taxpayers who fund AEO reports deserve realistic estimates of future production, costs of production, and prices needed for profitable production. Otherwise, the agency's pronouncements will continue to resemble those of the Wizard of Oz: Be amazed! Be awed! But pay no attention to the man behind the curtain.