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*MuseLetter #308 / January 2018 by Richard Heinberg*

*On November 30, 2017 at the New England Conservatory of Music, Richard performed Paganini's "Sonata Concertata For Guitar And Violin" and spoke about what the future might mean for today's young musicians and artists, and the important role they have to play in the societal transformation ahead.*

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**Full transcript:**

Over the next few minutes I hope to share with you a little of what I've learned about the likely trajectory of industrial society for the remainder of this century, and some speculations about the possible role of music and related arts within that trajectory. Perhaps the best way to introduce the ideas and information I want to share is to tell you some of my personal story.

I grew up in the Midwestern states in the 1950s and '60s, where my interests swung between the sciences (my father was an industrial chemist) and the arts: I loved drawing and painting, and at age 11 fell in love with classical music. I demanded that my parents get me a violin, and fortunately when they did they also paid for lessons with the concertmaster of the local symphony—a gentleman named Louis Riemer, who had studied briefly with Leopold Auer at Juilliard. Mr. Riemer gave me a good technical foundation on the instrument, for which I will always be grateful. But, just as I was graduating high school and heading for college, the Summer of Love and the Vietnam War overtook America. Suddenly playing Haydn quartets seemed less interesting.

At the University of Iowa I continued with music lessons and played in the orchestra, but spent increasing amounts of time attending protests, experimenting with psychedelic drugs, and listening to the Grateful Dead. I taught myself to play the guitar and spent the next seven years professionally playing electric guitar and electric violin in rock bands. But something else happened right after college that would eventually send me down an entirely different path: I started reading environmental literature.

Probably the most influential book I came across at the time was *The Limits to Growth*. A team of young experts in a new field called systems dynamics, working at MIT, had used a computer to model the likely interactions between Earth's resources, human population, pollution levels, food production, and other basic factors of the

economy. They found that, in their models and simulations, global growth in population and industrial output could be maintained for only a few decades, no matter how they jiggered the software or the input data. Doubling Earth's resources would put off the inevitable peak and decline by only a few years. The only way to generate a scenario without a crash was to model policies to end population growth and dramatically cut the rates at which we're consuming resources. In other words, the only way to avoid the collapse of civilization was to voluntarily scale back just about everything we're doing that entails interaction with the physical world around us. At the time, the *Limits to Growth* authors were optimistic that, once policy makers understood the alternatives and the consequences, they would choose to restrict population and consumption.

However, the notion that economic growth might fairly soon crash against the planet's limits proved extremely unwelcome to economists and politicians, who had come to count on the endless growth of the economy to provide jobs for workers, profits for investors, and increasing tax revenues for governments. Articles appeared in *New York Times*, *Newsweek*, and other prominent publications pretending to debunk the idea of natural limits. Ronald Reagan would soon insist that "There are no such things as limits to growth, because there are no limits to the human capacity for intelligence, imagination, and wonder." That's an inspiring sentiment. But, of course, the MIT scientists hadn't been modeling intelligence, imagination, or wonder. They were looking at mineral resources, soil fertility, and the capacity of the atmosphere and oceans to absorb wastes and pollution. Imagination and wonder are terrific, but by themselves they don't increase the size of the world's forest cover or the number of wild fish in the oceans. In reality, the pushback against the MIT study was all smoke and mirrors.

An abundance of subsequent research supported the *Limits to Growth* scenario studies. The computer software used in 1972 was primitive by current standards, but it has been upgraded regularly since then. The data have also evolved in the intervening decades. Today you can supply upgraded software with the very latest figures on population, resources, food production, and industrial output, and climate change, and essentially the same scenarios will tumble onto your computer screen. The "standard run" scenario, in which policy makers continue to seek as much growth as possible, always shows a peak and decline in world industrial output around the end of the first quarter of this century, followed by declining food production, then declining population. And here we are, rapidly approaching the end of the first quarter of the century.

Five years after the publication of *The Limits to Growth*, I was experiencing my own limits—in terms of success in the commercial rock music scene. In retrospect, that was a very good thing. Making music is often wonderful, but the music business often isn't. With my interests straying toward other subjects, I started writing essays as a way of making sense of the world. My stuff started getting published, and soon I was making my living with words.

In effect, I was chronicling the early phase of society's collision with natural limits as it was happening. Here's the current scorecard: We're now losing 25 billion tons of topsoil a year due to industrial

agriculture. At the same time, we're adding 80 million new humans each year on a net basis, with our population growing by about a billion every 12 years. Meanwhile, the planet is reeling from human-forced global warming: glaciers and permafrost are melting, the seas are rising, and the pace is accelerating. Global wildlife populations have declined nearly 60 percent since the 1970s, and species are going extinct at 1,000 times the normal background rate. Healthy coral reefs could be completely gone by 2050, and by then oceans may be almost completely free of fish due to climate change, overfishing, pollution, and habitat loss.

Over the years, I have written several books about fossil fuel depletion, co-authored a lengthy report on the unsustainability of our current food system, and researched and discussed climate change and other pollution issues. I even produced a book in 2011 titled *The End of Growth*, which explains in some detail how we are living out the "standard run" scenario from 1972.

Along the way, I've tried to satisfy my own curiosity with regard to the question, How and why have humans gotten themselves into this mess? Finding answers required that I delve into history and anthropology. It turns out that, while we humans have been expanding our range and altering our environments for millennia, our efforts got turbocharged starting in the nineteenth century. The main driver was cheap, concentrated sources of energy in the forms of coal, oil, and natural gas—fossil fuels. These were a one-time-only gift from nature, and they changed everything.

Energy is essential to everything we do, and with cheap, abundant, concentrated energy a lot became possible that was previously unimaginable. We used newly invented technologies to channel this sudden abundance of energy toward projects that everyone agreed were beneficial—growing more food, extracting more raw materials, manufacturing more products, transporting ourselves and our goods faster and over further distances, defeating diseases with modern medicine, entertaining ourselves, and protecting ourselves with advanced weaponry. We used some of our fossil fuels to make electricity, an extremely versatile energy carrier that, among many other things, enabled music to be amplified, recorded, and reproduced on an assortment of media. In short, fossil fuels increased our power over the world around us, and the power of some of us over others.

But our increasing reliance on fossil fuels was in two respects a bargain with the devil. First, extracting, transporting, and burning these fuels polluted air and water, and caused a subtle but gradually accelerating change in the chemistry of the planetary atmosphere and the world's oceans. Second, fossil fuels are finite, nonrenewable, and depleting resources that we exploit using the low-hanging fruit principle. That means that as we extract and burn them, each new increment entails higher monetary and energy costs, as well as greater environmental risk. Basing our entire economy on the ever-increasing rate at which we burn a finite fuel supply is the very definition of stupid. And yet we do this with brilliant technical efficiency.

Fossil fuels made us a more successful species, able to increase our

numbers and averaged per-capita consumption, and powerful enough to steal rapidly increasing amounts of ecological space away from other creatures. This success has had serious side effects, including the fouling of air and water, the decline and extinction of a rapidly growing list of other creatures, and the increasing lethality of warfare. Fossil fuels made rapid economic growth possible, yet the expansion of Earth's carrying capacity for humans, based on fossil fuels, must inevitably prove to be as temporary as those fuels themselves. Like rapidly proliferating bacteria in a Petrie dish, we are destined to consume our nutrients and face the consequences.

In 1997, I was invited to help design, and teach in, one of the first college programs on sustainability. Ten years later, I joined the environmental nonprofit think tank Post Carbon Institute as Senior Fellow, a position I am happy to fill currently.

Throughout all these years there was always music. I played wedding and orchestra gigs, and enjoyed concerts and reading sessions with string quartets and string trios, and duos with guitar or piano. Today, I still spend two hours a day practicing—you know the drill: an hour of scales, arpeggios, and etudes, followed by an hour or so of repertoire—doing my best to hone my modest technique and learn new music. It's nearly always the highlight of my day.

How do these two activities—writing about our environmental crisis and playing music—fit together? And more deeply, what role might music and the arts generally play as part of our human response to climate change and ecological overshoot? 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 we musicians can make at this moment in history to bravely go down with the ship, lifting the spirits of other passengers? I think we can do quite a bit better. What I mean by that will take a while to unpack, and will require a little meander.

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We might start by asking, What makes a culture worth sustaining? One answer that comes to mind is, *beauty*—from the spare, honest beauty of a Zen temple or a shakuhachi flute, to the over-the-top ornate beauty of an Italian Renaissance cathedral or a Puccini opera. Aesthetics are a product of time and place. But the human response to beauty, and the urge to create it, are instinctive and transcend humanity itself.

We know this because other animals are also obsessed with beauty. During the 1940s, English musicologist Len Howard devoted herself to studying the music of wild birds. According to Theodore Barber's account of her work (in his marvelous book, *The Human Nature of Birds*),

she became personally acquainted with many and knew some for their entire lives. . . . Her intimate study of bird songs led to . . . surprising conclusions:

1. Birds, like humans, enjoy their songs. They take

pleasure in singing, and they enjoy hearing even their territorial rivals sing.

2. Birds not only convey messages and express feelings and emotions in their songs, but at times they sing simply because they are happy.

3. [Birds of the same species] can be reliably identified by their unique variations of the species' song. In fact, conspecific birds apparently differ in musical talent as much as humans. This unexpected variability is due to the individual bird's interpretation of the theme, his technical ability in executing it, his "style" of delivery, and the quality or timbre of his voice. Some very poor singers are found in every songbird species. . . . There are also very superior musicians among songbirds. For instance, over a period of a few days, a talented blackbird creatively and spontaneously composed the opening phrase of the Rondo in Beethoven's violin concerto. (He had *not* previously heard it.) During the remainder of the season he varied the interpretation of the phrase; "the pace was quickened toward the end . . . a rubato effect that added brilliance to the performance."

Of course, it's a long way from a bird's song to a performance of Mahler's "Resurrection" symphony; the latter is a lot more complicated and expensive to produce, and requires a lot of cooperation. Music and the other arts came to be developed to extremes of complexity largely as a result of the process of professionalization—which again can only be understood in terms of anthropology and history.

Hunter-gatherers had music, but it was relatively simple—as simple and beautiful in its way as a birdsong. With more intensive means of food production—farming—we were able to produce food surpluses that could be stored. That enabled the construction of cities and full-time division of labor. *Homo sapiens* has been around for about 350,000 years, but farming is a comparatively recent development, starting only about 10,000 years ago. It was a fateful shift. For the first time in the human story, we see writing, money, and far more sophisticated weapons and other tools. We also see full-time artists and musicians.

Each of these developments, and each of these technologies, changed us. For example, Marshall McLuhan and others have pointed out that the use of writing, and especially alphabetic writing, tended to nudge our thought processes in certain directions. As the classicist Eric Havelock once put it,

It is only as language is written down that it becomes possible to think about it. The acoustic medium, being incapable of visualization, did not achieve recognition as a phenomenon wholly separable from the person who used it. But in the alphabetized document the medium became objectified. There it was, reproduced perfectly in the

alphabet . . . no longer a function of “me” the speaker but a document with an independent existence.

The earliest important document in alphabetic script was the Bible—The Book. And to this day millions of people regard that document with awe as an almost animate source of absolute wisdom and authority. Johann Sebastian Bach was himself devoted to the Good Book, and he lived not far from the birthplace of the printing press, an invention that further intensified the psychological impact of the written word by emphasizing (through its movable type) the interchangeability of alphabetic characters, and by enabling the majority of the population to own and read printed Bibles. The printing press also set inventors to contemplating the usefulness of interchangeable parts, thus helping seed the industrial revolution.

If the writing of words made human thinking more rational and sequential, the writing of music had an analogous effect. Rather than being memorized, tunes could be jotted down and read later, perhaps by someone else who had never heard the tune before. Tunes could become more complicated, yet still be “remembered” on paper. Tunes could take on an existence of their own; they could be bought and sold.

Every new technological advantage implies the potential loss of some former ability. Writing, as Plato noted, saps the memory. Similarly, reliance on musical notation does little to foster the ability to improvise. Everyone who has spent much time around a professional orchestra knows that most classical string players are spectacular sight-readers but utterly inept improvisers (though that’s changing). How many times have I been requested to “Play us a tune,” only to hear myself reply ineptly, “But I don’t have any music with me. . . .”

And so progress is usually a tradeoff. And like biological evolution, it is only temporarily directional. Evolution doesn’t have a final goal in mind; it’s just an endless process of adaptation. Often it leads to dead ends. All species eventually go extinct, and, sometimes, vast numbers of species go extinct all at once. Similarly, cultural evolution appears to proceed in cycles: over the past ten thousand years, roughly 24 civilizations have arisen, but they have all tended to go through a process of expansion and then collapse. With our linguistic brains, we tend to assign cosmic meanings to these gains, and often-rapid losses, of complexity. But in the end, it’s not about smiling or angry gods; it’s not about human ingenuity or collective moral decay; it’s about environmental carrying capacity.

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In his theory of culture, anthropologist Marvin Harris located the arts in what he called the *superstructure* of society, together with religions and ideologies. In Harris’s formulation, the superstructure and *structure* (politics, economic system) of society primarily tend to respond to changes in *infrastructure*, which is the interface between society and nature, the means of production and reproduction. With one type of infrastructure (hunting and gathering), we get a consistent set of tools, religious practices, and ways of organizing society, across the globe. With another type of infrastructure (early forms of agriculture) we see the rise of kingdoms, the appearance of

sky-god religions, writing, and so on—whether in India, China, Central America, or Mesopotamia.

Harris's view would have been that the industrial revolution and overwhelming societal changes that flowed from it—the growth of the middle class, credit, advertising, mass marketing, propaganda, mass political movements—didn't happen primarily because of literary, musical, or artistic efforts; they occurred largely because we discovered rich new energy sources. Abstract expressionism didn't drive the social, cultural, and psychological changes of the twentieth century; rather, the art of Pollock, Kline, and de Kooning emerged in response to the development of photography and psychoanalysis, and to the social and personal alienation brought about by industrialism. With color photographic reproductions everywhere cheaply available, representational art came to seem hokey and pointless. Instead of painting people and nature, the artist's job was now to portray the interior of the psyche. Similarly, electronic music—including amplified rock music—followed upon the electrification of society, it didn't inspire it.

Material conditions change; then consciousness changes; and new art forms follow to express changing consciousness. Sometimes the artist appears as a revolutionary or a social critic—think Woody Guthrie, Rage Against the Machine, or Geto Boyz. Other times, the artist is little more than a commercial or political tool.

In either case, the artist's efforts help shape the terms by which society adapts consciousness to its infrastructural regime. The artist does modify culture, but cannot do so in a vacuum. Where there are grounds for a revolutionary movement, the artist can help give it identity and cohesion. On the other hand, employed by society's elites, the artist can forge images that galvanize enthusiastic cooperation—whether in support of a political candidate, or in service to the projects of selling more breakfast cereal or waging a war.

The enormous complexity of modern industrial civilization theoretically offers a far wider scope for creativity than was the case in previous societies: every industrial artifact—from the paper clip to the computer mouse to the laser scanner in the grocery store to the handle on a refrigerator—has to be *designed*. We in the modern industrial world are thus surrounded by art to a degree unparalleled in any earlier society. City dwellers must exert effort—sometimes, considerable effort—to see a surface not designed by another human, or to hear a sound not generated by humans or their machines, including music playback machines.

In addition, the population densities that are afforded by the modern city, and thus the opportunities for interaction among artists, permit an extraordinary level of development of technique. There are more piano virtuosos alive today, playing at a higher level of technical perfection, than at any other time in history. The same with nearly every other medium: there are more highly skilled sculptors, painters, calligraphers, ballroom dancers, or whatever, than ever before.

But we pay a cumulative price for this artistic bonanza. By confining ourselves within a human-designed—and thus human-centered—universe, we cut ourselves off from the true source of art—which is

nature. Technical perfection and media sophistication cannot replace naturalness of gesture. We stumble from the movie theater, sated and numbed. We get into the car, cue up some music, and drive home. We turn on the television and glance at it occasionally as we devour a logo-emblazoned deli sandwich from the refrigerator. The semblance of life grows ever more convincing as the reality of life disappears in a forest clear-cut somewhere beyond view from the highway.

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However, as I tried to convey a few minutes ago, the current environment for the arts—urban industrial society—is basically unsustainable. Which brings us to the subject of our future. Society a few decades from now will operate very differently from how it does now, or it won't be operating at all. At the base of this shift will be our energy regime: society will have to move away from fossil fuels this century to avert catastrophic climate change. And if it doesn't, fossil fuels will move away from us as a result of depletion. One way or another, our societal infrastructure will shift. This will probably be as profound a historic rupture as the industrial revolution itself, maybe comparable to the agricultural revolution 10,000 years ago.

It's tempting to think that we can just unplug coal power plants, plug in solar panels, and continue living essentially the same as we do now. But this is wrong in two ways.

First, it's important to understand the fundamental differences between intermittent renewable energy sources like solar and wind, and depleting but available-on-demand fossil fuels. I recently co-authored a study, with David Fridley of Lawrence Berkeley National Laboratory, titled *Our Renewable Future*, in which we examined how energy usage will need to change to accommodate these new energy sources. We concluded that energy usage in highly industrialized nations like the United States will have to decline significantly, and whole sectors—transportation, manufacturing, and agriculture—will need to be transformed to run on electricity rather than gaseous or liquid fuels. Our existing systems were built to fit the strengths of our incumbent energy sources; nearly everything will require rethinking to take advantage of the inherent qualities of solar and wind power. It would make sense, for example, to decentralize systems, to make them more distributed and localized, and to use energy when it's available, rather than expecting to use it 24/7.

But there's another reason that it would be wrong to think we can keep living essentially as we do now as, and after, we make the energy transition: our ecological crisis is not all about climate change. If climate change were the sum total of our environmental challenge, then all we'd need to do is get rid of carbon emissions and we'd be good to go. Don't get me wrong: climate change is by far the worst pollution dilemma humans have ever faced, and if we don't deal with it all of Earth's creatures are in for one hell of a ride. Yet in addition to climate change we also face mass species extinctions due to habitat loss, along with the depletion of soil, water, and minerals. Our population continues to grow even as habitat and resources disappear. We need a more comprehensive way of framing the ecological crisis; I prefer to speak of *overshoot*, a term familiar to

population ecologists. Due to a temporary energy subsidy, we have grown our population and consumption beyond levels that can be sustained long-term, and we are eroding Earth's capacity to support future generations. The only way to deal with overshoot is to dial back the whole human enterprise.

One way or another, whether as a result of adaptation or collapse, we can look forward to a future characterized by lower overall rates of consumption of energy and materials. That raises the question of equity. Will a few luxuriate in abundance while multitudes starve? That's a recipe for revolutions, coups, and the rise of dictators. Or will we learn to share both resources and scarcity while choosing to reduce our population to a sustainable size? Our future will also hold less complexity. That's because societal complexity requires energy. So if less energy is available, that will inevitably translate to less globalization and more localized, smaller-scale economies. Our future will feature a less-stable climate. We will need more resilience—more adaptability, as well as redundancy in critical systems. We will need to learn how to fit into nature's cycles rather than imagining that we can dominate our planet and move on to other planets once we've chewed our way through this one.

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If, rather than simply collapsing, society adapts by becoming less centralized, more localized; if population and consumption (especially in wealthy countries) shrink rather than continually growing, then how will artists be affected by this extraordinary transformation? How could they help lead it? Perhaps the obvious answer is to produce sustainability-themed operas, motion pictures, concerti, country-and-western songs, string quartets, and computer game soundtracks. However, I think we could also be more—um, *creative* in our thinking.

First, I think we need to be honest with ourselves. The next years and decades will be filled with challenges of all kinds—foreseeable and unforeseeable. It will be a turbulent time and may not provide a stable platform for a tranquil, uninterrupted career in a symphony orchestra or even a touring rock band. It's hard enough to be a successful musician in the world as it is, but someone's about to move the goalposts, deflate the football, and rewrite the rules of the game. That doesn't mean that making music isn't worth the effort. It just means it will be important to avoid tunnel vision, and to pay attention to what's happening in society as a whole so as to be able to adapt quickly and be in position to take advantage of opportunities.

I'd like to suggest three broad projects for musicians and other artists for the remainder of this century:

1. **Preserve our culture's greatest achievements.** Musicians tend to assume that the works of Bach, Mozart, Ellington, and other great composers constitute a common heritage that will last for the ages. It's sobering to reflect on how much was lost of ancient Egyptian, Greek, and Roman culture when those civilizations fell. Sheet music printed on acid-laced paper will

disintegrate over time; so will magnetic tape, CDs, and computer hard drives. Music cannot survive if it isn't continually refreshed in live performance. If we really love this music, it's up to us to carry it forward—to play it and to teach the needed and satisfying skills of music performance to younger generations.

2. **Help society adapt.** As societies change, it is up to artists to reflect people's feelings and experiences back to them, transformed into art that's inspiring and healing. Think of how Beethoven helped reflect the beginnings of modern democracy, the Romantic Movement in poetry and philosophy, and the nascent industrial revolution—in music that shattered the aristocratic formalism of previous generations. Or recall how Shostakovich translated the horrific and protracted siege of Stalingrad into his tragic yet also hopeful Eighth Symphony. Now think ahead. We have embarked on a century in which all the systems we have built since the start of the industrial revolution—our food system, our transport systems, our energy system, our buildings systems, our financial system, and possibly our political and governance systems as well—will prove unsustainable. At the same time, the natural world will be shifting around us in unprecedented ways. Everything will be up for change, redesign, and negotiation. This may turn out to be the great fulcrum of history. 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 mentally understand, but to viscerally come to grips with events. And society will need the service of artists as never before as we re-weave the fabric of local community.
3. **Do what artists always do, what even the birds do: celebrate life's beauty.** Our charge is to do this well, in fact better than ever. Life is precious, and our planet is precious. As Joni Mitchell put it,

Don't it always seem to go

That you don't know what you've got 'til it's gone?

They paved paradise

Put up a parking lot

Perhaps the most important job of the artist, after all, is to remind us that we're already in paradise. No parking lot needed.