

PACE LAYERS

Bruce Sterling

Design struggles with a world of broken, ugly objects and services, while we science fiction writers are painfully bored by a world that's duller than we can bear. Why is the world like that? Why hasn't the whole system been swiftly upended by one designer judo-throw? Why haven't a flock of chrome-plated black swans arrived from outside the box?

Why can't design and science fiction seize the world with a rush and a push, junk all the broken rubbish, and dwell henceforth in a *Gesamtkunstwerk* Norman Bel Geddes Futurama, where design and science fiction would likely be both equally contented and have plenty of work on their hands?

In order to explain this state of affairs, I have to resort to a futurist schematic on the brink of literary metaphor. I learned this from Stewart Brand, who learned it from Gregory Bateson. It's called "pace layering."

Pace layering is not scientific. It's not falsifiable, it can't be quantified, and it's basically a form of Californian mysticism (**Fig. 1**). However, whenever I'm asked to speculate about what's likely to happen, I commonly have recourse to pace layering. I use it because it works so well; the results are plausible and sound commonsensical.

Many better-known methods of futurist speculation commonly boil down to pace layering. An awareness of pace layering can save a lot of heartbreak for a would-be system revolutionary.



Fig. 1 Bruce Sterling with stereoscope, Turin. Courtesy Bruce Sterling.

The core idea of pace layering is that there is not just one system in the world. The world is multisystemic; it's onion-like. The upper layers are light, airy, and swift-moving, while the deeper layers beneath them are dense, seismic, and slow.

Everything changes, just as Heraclitus said, but never at the uniform speed of his rushing stream. Changes arrive at different speeds, wheel within wheel. Some things go, while others hang around quite a while, which is why science fiction writers still quote the quips of Heraclitus.

The surface, in which designers and science fiction writers both frolic in the happy daylight, is the fastest pace layer. This layer is called "fashion." Fashion is hyperactive, but its churning transformations rarely have lasting consequence.

Mind you, fashion is not new, it's ancient (**Fig. 2**). Tattoos, cosmetics, and hairstyles are all prehistoric. So fashion is no younger than the other layers; it just generates artifacts that come and go with the shelf life of a Pantone color choice.

Below the pace layer of fashion is "commerce." If fashion is the street, then commerce is the marketplace. Commerce is also very old, although its pace is rapid. Chanel jackets change every fashion season, but the Chanel business enterprise has well outlived its founder's mortal lifespan.

There is no way to make fashion slower than commerce, or to make commerce faster than fashion. I can't explain why this is so, but it is. Pace layers rotate like nested spheres in a Ptolemaic universe. If commerce becomes somehow hot and frantic, then fashion will become feverish and hysterical.

Below business and commerce is the pace layer of "governance." Here science fiction and design are strangers to the scene, aliens from a distant pace layer. No designer ever designs her way into the U.S. Senate (though one would think that proper interaction design would make that task pretty easy). America's most politically accomplished science fiction novelist, Newt Gingrich, is a daffy, ranting visionary with no staying power.

Fast-moving creatives from the fashion layer lack the time for grave political commitments. They shy away from politics because they know that "nothing is going to happen." If you testify to Congress, arranging this act of political theater takes weeks. You will spend ten minutes speaking at grandees who are visibly ignoring you. People become upset if you disrupt that process with novel or surprising information. Creatives will vote and also complain a lot, but they lack the *Sitzfleisch* of career power-politicians, who can sit through anything.

This is the native pace of life at the governance pace layer. If government works any faster, then the layers above them, commerce and fashion, are placed in immediate peril. So it won't be business-as-usual any more, and fashion will



Fig. 2 The Muse of History, Milan. Photograph Bruce Sterling. Courtesy Bruce Sterling.

likely be rationed. In the jolting, crisis-laden era of King Stork, everyone prays for King Log.

Mind you, all the pace layers are entirely capable of rapid, sudden change—revolutions, epiphanies, catastrophes even. But they'll be fewer and farther between as the depth increases. Since the faster layers are piled atop the slower ones, the effects of change will mostly propagate upward. A fire on the ground floor leaps to ignite the roof.

Below the pace layer of politics is "infrastructure." In theory, infrastructure is under political control, but in practice it isn't. Infrastructure is slower in pace than electoral cycles. This is why bureaucracies commonly outlast and out-wait any whims of elected officials. It's also why the three vast titans of the military-industrial complex, the medical system, and the fossil-fuel business basically own the American government.

It's easy to see that all three of these vast, sluggish systems are badly designed and broken. The military has endless wars, the health system kills off the population, while oil and coal have wrecked New York, New Orleans, and the drought-stricken flyover states. They're broken, but not from entropy, thoughtlessness, or neglect. They're broken because the breakages serve the interests of the owners of the infrastructure. The installed base is too big to fail. It outlasts the cricket-chirping of its critics.

The power of infrastructure is easy to see when one removes oneself from the shibboleths of a particular government. Russia, for instance, is a gas-pipeline infrastructure with a state perched on top. The Soviet Union sold oil, and collapsed. The Communist apparatchiks were replaced by Yeltsin's privatization moguls, who also sold oil and also collapsed. They were replaced by the Putin elite of FSB spies, who still sell oil. Putin can die, and his clique can be purged by whatever comes next, but the oil infrastructure will still far outweigh the public interests of the Russian populace. They will watch their tundra catch fire from climate crisis and wonder how such things could be in the world.

To understand that infrastructure goes deeper than politics was the great insight of Silicon Valley. It's why they always build without asking permission first. Infrastructure also explains the success of the current Chinese government, which consists of Red engineers rather than Red ideologues. It's the source of the unity of the European Union, which always avoids voters and promulgates infrastructure standards instead. Even designers dabble in infrastructure, when they make new materials and new processes fashionable.

Infrastructure is not the deepest pace layer. Below it is "culture," the layer of values, beliefs, and metaphysics. The current American political polarization—the "broken politics"—are broken on purpose. The purpose is deeper than mere political struggle: it's a fifty-year-old civil cold war about culture.

Tremendous shear forces exist between the layers of culture, infrastructure, governance, business, and fashion. A lot can be accomplished in the weak and slippery seismic zones between the layers; consider a trend that becomes a new business, an ambitious business that buys itself a senator, and so on.

It follows that the best timing for a change in the situation in your own layer is a time of spasm in the layer below you. To out-guess events in your locale, you need to see what's happening on this deeper level. Try to understand why it happened, then translate that change into the attitudes and practices of your own situation.

That can be done. Other things can't be done. For instance, there is no way to freeze all the layers in place and rationalize them from top to bottom. Though they all coexist; you can't synchronize your eager heartbeats to the changes of the seasons and the grinding of tectonic plates. Revolutionary "Year Zero" efforts will be subverted and overthrown. It's why totalitarian government resorts to book burnings and mass murder; to start over fresh means to liquidate everybody and demolish everything.

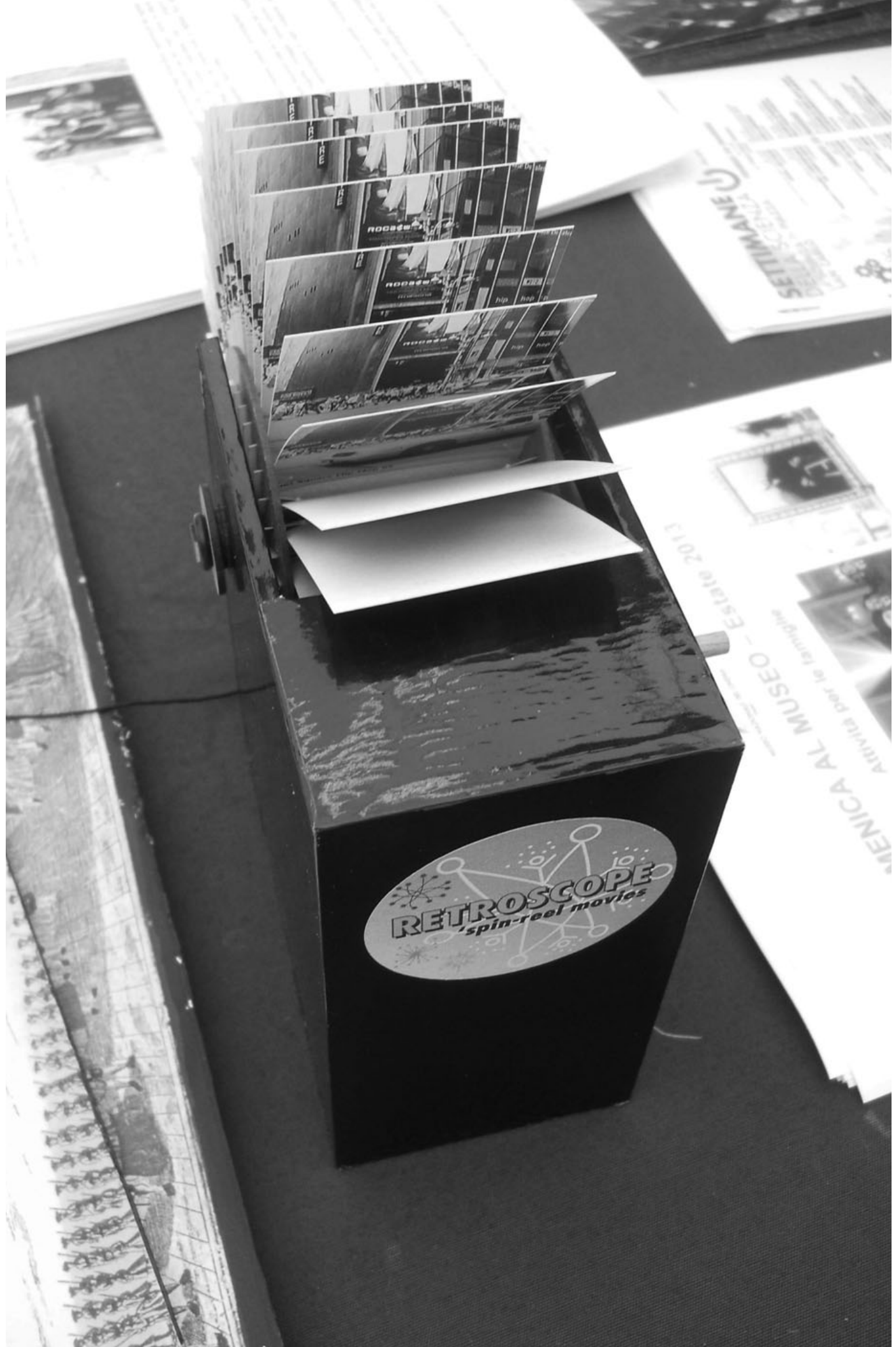
Reason and persuasion find their limits in culture. You can't argue people out of their culture any more than you can argue your French girlfriend out of being French. She is French, she will stay French, so you either have to love her for that, or else give her up.

Mind you, a cultural pace layer is in motion like all the others; it's just slower paced (**Fig. 3**). The American children of your French wife will become Americans, because they've been subjected for a lifetime to American culture along with American infrastructure, governance, business, and fashion. They'll become obese kids with handguns who vote Republican and shop at The Gap. However, when someone sings "Frère Jacques" in dear old Maman's nostalgic tone, they will weep uncontrollably.

Below the pace layer of culture is the primeval layer, that of "nature." People sometimes imagine that nature is a static realm of eternal verity. It isn't. Nature can change just as suddenly and drastically as any other pace layer. There have already been five massive extinctions of life on Earth during Earth's natural history, and we're in the midst of a sixth one.

Changes in nature are the grand stuff of legend and prophesy. They're earthquake, typhoon, famine, and pestilence; they're Nuclear Winter and a new Dark Age. They're Green Revolution and personal immortality; they're Singularities and terraforming of other worlds; they're Artificial Intelligence and the Big Rock Candy Mountain, where the hoboes eat roast chickens that grow on trees. They're legends that are mostly romantic and imaginary, except when they're real.

When nature changes, the long-established moral values of the culture layer are tossed in the air like so much New Year's confetti. Even history goes up



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for grabs, because the stories we tell ourselves about the past are reassessed in the light of the contemporary. In the cold light of a transformed world, even History will change her mind.

Consider the curious fate of the great designer Raymond Loewy, whose atelier created the iconic Coke bottle and the Lucky Strike package. In the fashion and business pace layers, those were two terrific successes; in the nature pace layer, they killed off millions of the consumers that Loewy struggled to serve. The market valorized them, while human anatomy disagreed.

It's not that Loewy made the wrong moral decision; that moral decision never came up for him at all. If Loewy had declared, "I refuse to work for Coca-Cola, for they make people fat; while Lucky Strike are merchants of cancer and asthma," Loewy would have been universally condemned as a kook. Coca-Cola was the very symbol of American industrial predominance. Tobacco was the oldest and most honored American narcotic. Morally rejecting tobacco was like kicking Sir Walter Raleigh in the shins. So Loewy did the proper thing at the time, as, all too commonly, we all do.

We've never had a moral value system that can out-think pace layers. Morality is deep and slow, but it's not the slowest and deepest; nature predates humanity, and it will post-date humanity, too. The best that morality can offer us in that very, very long run is the sour guide that "All is Vanity." Sure, it is, but in the long run we're all dead.

To say, "In the long run we're all dead" is a very science fiction statement. It's the Huxleyan natural history lesson of H. G. Wells in *The Time Machine* and the Alpine gray abstractions of Olaf Stapledon in *Last and First Men*. It's a contribution of science fiction that isn't pop rubbish; it's classic. We human beings are the mayflies of the deepest pace layers.

If we embrace that Lovecraftian point of view, though, it's obliterating; it taints the brief experiences that make life so worthwhile, such as a decent lunch. It happens to be a cold and stellar arena where science fiction triumphs over design, but, frankly, who cares? A tiny fraction of the population knows who Olaf Stapledon was, while everyone and his sister has a designed cellphone now. For a while, that is.

Most schemes used today to out-guess futurity are subsets of pace-layer thinking. For instance, most efforts within the design world will fit well within a simple cycle of four basic phases. "Question Mark, Rising Star, Cash Cow, Dead Dog." These four states of products and services are entirely typical of a world dominated by capitalism.

Fig. 3 Retroscope, a dead media device, Turin. Photograph Bruce Sterling. Courtesy Bruce Sterling.

Question Mark is the phase of basic research and development. It's a tight, cultish world of self-appointed tech elites who literally don't know what they are talking about. Some newfangled phenomenon has arisen, and there's a paradigmatic struggle to name it and to fund it.

Nobody makes much money in the Question Mark quadrant. On the contrary, they consume money: from academia, government, venture capital, crowd-sourced Kickstarter funds, anyone who'll fill the innovator's begging bowl. The most common answer to this Question Mark is simple: it's mere fashionable rubbish. It's a red herring; there is no there there. It's intellectually sexy, yet it lacks substance.

The next quadrant is the Rising Star. A consensus emerges that this phenomenon is more than a vaporous techie conceit; it's commerce. The Question Mark receives some exciting, specific answers: someone needs it, it has real uses and applications, it has taken material form. Designers flock to this boundary between the concept and mass acceptance. The Rising Star shines on design, because designers have more power and influence in this quadrant than they do anywhere else.

The third quadrant is the Cash Cow. A major corporation acquires a design atelier's product. A Cash Cow sells out. A Cash Cow is a slow, cud-chewing beast, but it supplies beef, leather, and milk. Government will number it and inspect it. Some infrastructure of stalls and troughs will be built around it. It'll become a cultural reality, an institution, taken for granted. It will bore science fiction writers, who will never write novels about it.

The fourth stage is the Dead Dog. It is obsolescence, the fate of the defunct and the useless. The Dead Dog is the haunting specter of the unsustainable. It is the vastest quadrant, huge, ever-growing. All is vanity, and every assembly line leads to the junkyard.

Designers are aware of this situation, but there are no specialized Dead Dog designers. Design as a discipline provides shiny new objects and services to the world; it never deliberately removes the rusty, dreadful, existing ones. Design has never created a functional hook with which to drag designed objects off the world stage.

Design has created some cleaner, more sustainable methods of production, such as cradle-to-cradle design and its many green cousins, but there are no design undertakers directly specializing in dead things. However, as the deepest pace layer grinds on, the dead things will be most things, and eventually all things.

We humans never clean up a mess; we just idly hope that, somehow, the outworn will sink down into the nature pace layer and vanish. The hope is that

the toxic debris will rot faster than it can accumulate around us and within us. Unfortunately, that hope is mere wishful thinking.

A cousin of the Question Mark, Star, Cow, Dog quadrant is the useful “Gartner Hype Cycle.” Beloved by modern technologists of a digital slant, the Gartner Hype Cycle is all about language, or, rather, about how techies talk about technology under capitalism. The Hype Cycle has its distinct stages, which are analogous to the quadrants and also to pace layers. In order of occurrence, these phases are the Technology Trigger, the Peak of Inflated Expectations, the Trough of Disillusionment, the Slope of Enlightenment, and the Plateau of Productivity.

In the jargon of the Hype Cycle, a Technology Trigger is a fashionable novelty. Tripping this trigger attracts some attention. The Peak of Inflated Expectations is the loudest moment of chatter among the speculatives and the speculators. Sci-fi writers thrive here. They’re so eager for novelty that they’ll do technology’s public relations work for free. The Trough of Disillusionment occurs when the overblown hype is discounted. In pace layer thinking, this disillusionment is the shear force separating the fashion layer from the commerce layer. Cool ideas don’t necessarily sell. Successful design is harder to achieve than pundits like to admit. The Gartner Slope of Enlightenment is the investor-pleasing change from an awkward calf to a mature Cash Cow. The Plateau of Productivity is the Cow mooing her way into the lasting good graces of government, infrastructure, and culture.

The Gartner Hype Cycle is pretty good, as far as it goes, which is not very far. Because the Hype Cycle is all about talk, it fails in confronting the aspects of reality that people don’t talk much about: abject failure and inevitable obsolescence. The world doesn’t work on hype, because it’s real. In the real world, most tech startups fail. Many digital technologies are obsolete before they plateau, meaning that, in pace layer language, they are just fashionable gadgets; they are too frail to ever become governmental, infrastructural, or cultural; they’re mere passing fads.

Pace layer thinking is quite philosophical about that prospect; it accepts that most fashion is mere churn and always has been. In the business world, that attitude is dreadfully unbusinesslike, for it condones unconscionable wastes of the time and energy of the wealthy. It’s a comedy to those who think, a tragedy to those who feel.

One thinks more soundly when freed from the hype of any single pace layer. New things in the world have complex fates. They’re not the exclusive properties of any single sponsor; the street finds its own uses for things, and things also find their uses for the street. If you want to judge whether an innovation will thrive, it’s good sense to run a reality check on every layer.

In the nature pace layer: Is the idea even feasible? Does it defy the laws of nature, like a time machine or a warp-drive both do? Then that's not a product at all; it's sci-fi. Do not be deluded by its dramatic appeal, its cool metaphysical implications, or how great it looks as a prop in some comic book blockbuster movie. It's otherworldly. It's not going to happen.

Culturally speaking: Does the pope hate it? Then expect some long-lasting trouble. The pope may not have battalions, but he's got his methods. The pope's business is two thousand years old.

Infrastructurally: Does it scale? Is it too big to build and maintain? Is there no feasible way to physically remove a rival structure that is already sitting there, fully installed? Are entire thriving cities, maybe whole nations, specialized in making it and maintaining it? You're charging the windmill, Quixote. Better not try that alone.

Governmentally: Is it illegal? Everywhere? How easy is it to regulate? Is the fix already in at City Hall? Are you designing beautiful cardboard pro-bono shacks for the homeless while the cops are already deputized to move your clients right along? Your tears and good intentions won't help that situation. The clients aren't homeless because they lack designer cardboard; they're homeless because of legally established urban property relations.

Commercially: Are you going to manufacture it, sell it, distribute it, store it, and employ people? If so, then you're actually a product manager and an entrepreneur, not a designer. If you attempt to work in both layers at once, you'll be torn. Next time you get some brilliant, groundbreaking design notion, you will have to neglect that. The longer-term consequences of your first stroke of genius will consume all your time and attention.

The wheels are always turning. As the clock ticks, the contents of the layers tend to sink downward. Those that don't sink to the relative safety of a slower pace will tend to simply vanish from the earth.

A fashion that persists has business implications. A business that survives has legal and political implications. A nation-building government conveys a heritage of infrastructure. Infrastructure is not mere concrete and iron; it persists as a settled way of life, as a mode of cultural being.

In the metaphysics of pace layering, everything that beats the clock is dragged toward the core; when it's said and done, then it's culture, it's part of who we are. When it's no longer said or done by anybody, it's the mute Gothic silences of nature. Ashes to fertile ashes, the dust that is tomorrow's soil.