TRANSFORMA

BY GEORGE L. PAUL

"Transformation."

"Huh? What was that again?"

"Transformation. Now."

"Now? Okay. Whatever it is, it's now. Thank you. Good-bye."

"Mobile Transformation."

"What now? Mobile now? Stop being cryptic. Just tell me what you want to say."

"Trigger cascade morph New Complex off to the races BOOM."

"Whooaa! Not *that* fast. I promise to be open-minded, but I sincerely doubt it's as dramatic as all that. I highly doubt it. I may simply refuse to accept it."

Humankind's Transformation

Human culture and the global economy are currently undergoing a profound transformation. Some say it's the biggest thing since the Industrial Revolution. Others say it's the biggest thing since the printing press. Exponential trends have snapped together to create a new kind of citizen. The Transformation is jolting through the economy as an enormous pulse of information, affecting every area of commerce and human relations. It affects our search for jobs and how we hire; our health care; our education; our shopping habits; our recreation; our knowledge of where we are and where we need to go. Around the globe it has already created new societal institutions. The Transformation is spawning communities unencumbered by physical space and even native tongues—where currents of thought emerge to whip, crack, and pulse in harmony with a coevolving civilization.

This transformation necessitates a rewriting of rules, and of how we interpret existing ones. It affects how we resolve disputes and is revolutionizing what it means to be a lawyer. The legal edifice must immediately come to grips with the shocking Transformation ushered in by Earth's *several billion* devices—explosively growing smaller, more intelligent, more interconnected, and ever more closely held to the human heart and mind.

What Is Transformation?

Before getting down to what is happening, we must first examine the concept of *transformation*. It is *not* extremely rapid change. When a caterpillar nibbles on leaves and gets bigger, that's change. But at some point a transformation occurs. After it builds its chrysalis, the caterpillar secretes enzymes that digest its body down to a gooey soup of protein. Then special cells, called *imaginal*, catalyze the material. The blob rearranges, a beautiful new system emerges, and then it flies away.

Such is transformation. It is happening in our society. And it is happening now. Our preexisting system is unzipping and morphing and then zipping back up into an entirely new system. The new system is a global network of interrelated technologies—most importantly information flows communicating with one another. The system marks a new phase in civilization, perhaps even a new phase of our species identity. We are currently calling it the Mobile Transformation—but *mobility* is only one cog, within many cogs, in the New Giant Wheel.

You are present to observe the awesome spectacle, and people will soon realize responsibilities have been thrust upon them. Our new *Complex* just snapped

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"*A TRANSFORMATION IS UNFOLDING.* There are exponential hard trends. I say *IT'S BIGGER THAN THE DIFFUSION OF THE PRINTING PRESS*."

DANIEL BURRUS
CEO Burrus Research Associates, Inc.

PHOTO: iSTOCKPHOTO/KELLY BOOK

together with a worldwide, thunderous ring of the bell that will resonate throughout history. How well has it been described? Is it really so important? Where exactly is it?

What Is Exponential Growth?

To understand, one must first comprehend *exponential growth*. That great philosopher of language, the Taoist master Zhuangzi, explained that the human mind is almost always held captive—bottled up by the conceptual boundaries imposed by words. One can look at something yet still not see it, because the mind looks away.

Such it is with exponential growth—one driver of the Transformation. It is not the growth of everyday experience. Your hair grows. Your grass grows. Your children grow.

Exponential growth is fundamentally different. Imagine you are chatting over a chessboard. A friend puts one penny on the first square of the chessboard and says that one minute later he will put two pennies on the second square. After a minute he puts four pennies on the third and then eight pennies on the fourth. Soon he will have given you 16 pennies, all positioned on the fifth square of your board.

You smile because you have an intuitive hunch you may soon have *a lot* of pennies. Would you sell the stack on the last square for $100,000, or even $1,000,000 perhaps? Or, "I'm going to drive a hard bargain and demand $100,000,000. No. I want to be the richest person on Earth. Pay me $89 *billion*!" That would be a really bad deal—for you. All one need do is slowly double pennies, and on the last square there will soon be more than *92,000 trillion dollars*. How much is this? That is 1,000 times the *global* gross domestic product.

Exponential growth leads to end states difficult, if not impossible, to fathom. The graph starts off level, imperceptibly rises, and then suddenly "goes vertical." We need a more earthy word than *exponential*. In the spirit of Zhuangzi, perhaps we should call this *mind-blowing growth*.

Our Transformation Is Characterized by Mind-Blowing Growth

Why the fanciful chessboard? It's because the Transformation is driven in part by mind-blowing growth in interrelated technologies. Most have heard of Moore's Law. Today it is generally accepted that microprocessor performance doubles every 18 to 24 months, while plummeting in cost. Let's assume through analogy that processors had "one penny's worth" of computing power some time ago. Because of mind-blowing growth, for dramatically lower cost processors now have "a million dollars' worth" of power. When our children reach our age, their tiny processors may be one million times as powerful as those we have today. How long processing power will continue to do this is open to debate, but some see no end in sight any time soon.

Processing power is one dynamic. Now hold up that thumb drive. It has 16 gigabytes of memory, costs $9.99, and can be balanced on a finger. How much did 16 gigabytes cost just a while ago? When I was in college, it was $4 million.

Pixels per dollar may increase in the same mind-blowing way; so can 3-D technology, soon to be found on your miniature device. Network capacity zooms skyward. How many such processes are there? Perhaps you now have the unsettling feeling that there may be many—and that some exist outside machines and in the networks of human culture. In our universe processes exist that feed their own systems in an autocatalytic loop. Much of the economy is now built that way, and our

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public policy must therefore address it, as mind-blowing processes currently are shattering existing structures.

"Okay. Now you have my attention. I am a citizen, and you have persuaded me there are profound things happening all around me. I can't tell if there is a wonderful new future waiting, or my world will come crashing down. Not only am I listening quite carefully now, but I will also be asking questions. That's my right—and my duty—as a citizen. I simply demand to become better informed about this alleged *Transformation*. Please proceed. And do *not* condescend."

What Is Technology?

If you are serious, you need to understand technology. Luckily, it's not complicated. A societal technology consists in part of objects—useful inanimate things including tools, machines, and devices. The technical term is *hardware*. Software is practical human knowledge—also called *know-how*. It is often called by its French term: *technique*. There is the technique of how to create and maintain technology: *Technique I*. And there is also the technique whereby one uses technology: *Technique II*. Put a 1960s citizen in front of a computer linked to the World Wide Web. Nothing happens. No technique! *Technique II* is a society-wide technology. It's how we relate to the technology of the age.

No technology is an island. Technologies are networked with other technologies. Science may come up with a discovery, but it is often economically useless because it is not yet linked to other technologies. Accordingly, after a discovery or an invention, the second step in growing a technology is *innovation*. Technologists call it the *snake-pit problem*. Trying to conceive of and develop a new technology that links up to the bigger system is like sticking one's arm down into a snake pit. Many wrong choices. But choose the right one, and

it's, "Well done people! We are all now very rich indeed." Innovation is a homing in with no guarantees. But link up to networks and POW!

Once you have successfully innovated, there can be *diffusion*. This is when the new technology is picked up and manufactured—while a new *Technique II* spreads simultaneously. Thus, a new technology can spider-web throughout society.

Technologists therefore think in *clusters*. The coal/steam power/railroad cluster, for example, drove the Industrial Revolution. Branches of networks are born, mature, and then die. Forty-fives, 33⅓s, cassette tapes anyone? In the mid-1960s, technologists conceived of hardware and software interrelating to form mind-bogglingly complex machines. One technologist described the modern city as a "Mega-machine."

Importantly, the *relationships* connecting the constituents in such clusters are *themselves exponential*.

The New Technologist therefore has an epiphany. Society is currently experiencing mind-blowing dematerialization. Technologies are now largely multi-nested information flows that evolve exponentially. As they expand, they try to connect with more enveloping information flows. Sometimes, all it takes to make a potential, mile-wide orb start spinning furiously is its hookup with a one-inch-wide, lazily spinning circle. Different architectures of flowing information can suddenly become connected to one another. They exchange matter, energy, and now primarily information, and by doing so, they "communicate" and create pockets of order. There is then a radical newness, and the

architectures become much more than the sum of their parts. New Technologists say a novel behavior has emerged. Such behavior is only kind of a "thing." It's flowing, swirling stuff stabilized in a *phase*. A primitive form of such *behavior-thinginess* is a hurricane.

Because economic and information behaviors are largely held together by flowing information, ordered by exponential relationships that themselves can change, their phase is only quasi-stable. Such behavior is termed by the adjective *complex,* and the behavior itself is called *a complex*. Sometimes, when conditions are right, a tipping point is crossed; the networked, flowing order rearranges in a cascade of new exponential relationships; and a novel behavior for the system emerges. It can be shocking. And its details are unpredictable. Such exponential morphs are referred to technically as a *phase shift*. In complex behavior there is always a pulsing—with small, medium, or gigantic phase shifts that the New Technologist calls *transformations*. What we have in the New Economy are information waveforms, snapping together into complex systems, each reaching out so as to become nested inside other, more overarching information waveforms, themselves complex systems.

That is *complexity*. It's the punctuated equilibrium thing. It's how technologies, economies, human culture, the climate, and the system of life on Earth all behave. What is the historical progression of such exponentially interrelated, unfolding behaviors on Earth called? We call this *evolution*.

The Intimate Devices

"But what does this have to do with the alleged *Transformation*?"

It all starts with your device. Remember exponential growth? All that processing speed, memory advance, shrinking size, and ever-more sophisticated sensors don't exist in isolation. They are constituent subcomponents in networked technologies. We say *mobile* because mind-blowing technology is now used in the manufacture of incredibly tiny computers. The tiny machines are *complex* in the sense that no one person understands how they are designed or built. Many tens of teams, with hundreds if not thousands of people, may be responsible for each subcomponent. The teams are each behaving without detailed understanding of what the other teams are doing. Yet, because they are part of a larger evolving whole, the teams conduct themselves in harmony. Many minds combine for an overall technique no one understands, because the evolution of the device is guided by an Invisible Hand. The integrated system is a web of nested information flows that periodically snaps into a wonderful crystal of technology. Such tiny, complex machine systems are already, if not soon to be, our primary computing devices.

"Why *now*?"

There are slightly more than 7 billion people, and there are already 6.3 billion mobile devices. Soon there will be more devices than people on Earth. Innovative architectures continue to spring up with ever more sensors: cell phone signals, satellite communication, cameras, sound recorders, GPS devices, accelerometers, gyroscopes, WiFi, Bluetooth, and connections to more specialized devices. There is also *intelligence*. As one example only, the devices increasingly speak and understand our native tongues. Soon real-time translation may occur on the fly. Astounding capabilities grow exponentially, and the devices are ubiquitous.

Mobile will probably stick, but it's not precisely the right word. Laptops are "mobile." But the new devices are carried 24/7. There is no need to boot up or to sit down. Anyone in an airport, a line, or at a social gathering will from this point forward see fellow humans *mesmerized*. They stare down at devices with lips pursing, thumbs punching, or fingers tapping and sliding. Adrenaline is surging and

dopamine rising. The integration between device and mind is already so powerful it has become a societal addiction. People daily risk lives while driving because they can't shake the habit. Something more powerful than "mobile" is going on. The things are connected to our minds in a fundamentally different way. There's a new, networked connection there: device/mind. An emergent human behavior has diffused throughout society—a *Technique II* never before seen.

With improving screens, earphones, microphones, videos, sensors, shrinking size, and intelligence, Invisible Hands are building hardware devices to increase the new neural link between device and human consciousness. Very soon, we will wear our devices. They will have 3-D eyeglasses and earbuds feeding information directly into our minds. There is even now technology that allows one to click or tap by merely looking at part of a screen. It's actually kind of spooky, perhaps even slightly unseemly. There are secrets kept: special passports of access. There is the possibility for profound mind control. For all these reasons the tiny, seductive machines imbedded in our consciousness are far more than mobile. These are our *Intimate Devices*—the bedrock of *The Transformation*.

The Cloud

"Is that all there is to the Transformation—these Intimate Devices? Lay it on me."

There is *The Cloud*. Fundamentally, cloud computing is a global revolution in hardware and software exploiting *virtualization* at many levels. It is a new business model that has rapidly emerged and networked throughout our economy. It's a system where you pay only for what you use when you need it—as opposed to everyone buying everything they just *might* need. It's a mind-blowing plummet in the cost of running and connecting our Intimate Devices with exponentially increasing sophistication.

Accordingly, one hallmark of our Transformation is *dematerialization*. What used to be matter is now flowing energy. Before, we each had to buy boxes of machines; run cables through walls; rent real estate; and train workers to maintain information systems. Expensive. Now we place an order. Mind-blowingly inexpensive. Remember that $4 million of computer memory? With cloud computing, one can now rent a gigabyte of long-term storage for one tenth of one cent per year. That's *two pennies a year* for what used to cost $4 million not so long ago. We rent software, platforms, and infrastructure. In fact, practically anything we can imagine, we will soon be able to conjure up with exponentially decreasing costs.

We see mind-blowingly increasing *virtualization*. Information systems no longer reside in a definite place, but flow around from country to country without forewarning. And this is no nebulous cloud bank. It's more like white-hot energy, enveloping temporary phantoms designed by network builders. Clouds come with turbo-charged joysticks, with which society can steer custom-designed information crafts almost at the speed of light. We now have the ability to reach out to a supercomputer and then tap into enormous databanks. We do it every day. This allows society's new, nested information flows to more cheaply proliferate, and communicate rapidly so as to spin out novel structures. With the emergence of the Cloud, we have awesome new power hooked up with addictive new devices—themselves hooked into our minds. *Snap! Networks. Complex emerging.*

The Apps

"I bet mind control is involved elsewhere in the new exponential equation."

Of course, there are always those Invisible Hands. The first thing these Hands *always* do is command your attention. The Hands design for billions of their Intimate Device Users a seamless *Technique II*. They design the apps. The Hands have already designed more than 500,000. How many different permutations for one's device? It's astronomical. A corollary is that these options give us a personalized intimacy. There are even apps to help you choose which apps to choose, but don't be naïve: with that choice too you are kindly helped by The Hands.

There are relatively simple apps permitting one to order entire libraries that formerly weighed tons. One can walk in the forest with the vocalization of every bird species, right on your device. Other apps do optical character recognition. Most people stay informed in real time with several news service apps. There are already more than 10,000 mHealth apps. The Hands can increase the quality of your life.

But of course there are also apps using your device's accelerometers, gyroscopes, GPS components, and other sensors. A common app knows where you are to within a few feet, and plots a course to wherever you want to go. There are apps that read bar codes of any product in a store and then tell you where you can find a better price, instantly. Some tap you into air traffic control computers. Music recognition apps point at unknown sound waves, use super-fast processors to consult the Cloud, identify music, and suggest instant gratification—all in a couple of seconds. One can put an app on an Intimate Device to control a different device, an inexpensive flying device— almost a robot—all in order to *observe*.

Apps are taking money out of our pockets and piling it up elsewhere, exponentially. We love that. The Invisible Hands send us to special app websites, and it's a seamless flow terminating in a quick transaction. The complex of the quasi-neuroimbedded Intimate Devices, the Cloud, the apps, and the Internet put all the knowledge, information, and technique of the universe literally in our hands. We can zoom around anywhere on Earth, gaze down, zoom in, and even lurk around. Oh, but Earth's mighty kings of old wish they had possessed such majesty! We have emerged in a cultural way

entire institutions such as banking systems. In China, where there are more than one billion mobile devices, networks are starting to behave like emergent, giant minds. The government tries to crack down on innovation, but constituent minds pop up, spit out their messages just in time, and an organic behavior evolves.

Soon there will be hundreds, thousands, and untold numbers more interlocking mind networks, with increasingly sophisticated communication conventions written into software by Invisible Hands. Campaigns are being waged. Soon, multilingual armies will influence each other to attack, outflank, and envelop opposing thought with more numerous adherents—just as a collective Hannibal at a conceptual Cannae. A novel species-wide *Technique II* has gone viral. We see the emergence of a new sort of Mega-Mind.

The Transformation of Mind

"So, in the final analysis, just where is the Transformation?"

Many scientists now opine that our universe is only one among an infinite number, nestled inside a multiverse. Ours is astronomically improbable, but just precisely designed so as to permit evolution of human consciousness. Quantum physicists have long contemplated that nestled inside our perceived universe, there are an untold number of additional universes—each unfolding through human consciousness. That, at least, is what the quantum math says.

Let's be practical. We do inhabit separate universes. Certainly this is true in our everyday experience. What we have is our stream of consciousness and inner dialogue. We experience. We decide. We are ethical beings.

Almost all the intelligence of reality, constantly updated in real time, is now available to New Citizens in the palm of their hands. The challenge will not be access to information, but rather deciding what to do with it—including the moral and other decisions people make in their 10 to 20 thousand thoughts per day, during a three-second *psychological present*.

Don't be misled by thinking that this information tsunami is merely knowledge, viewed in an objective sense—outside the perceiver and upon which the subject acts. It is flowing *through* us. The relevant waveforms are each of our conceptual universes, interacting with the coevolving waveform of the planet. Thus, we can perhaps define "where" the *Transformation* can be found. It will henceforth envelop our existence. As we stagger around trying to cope, and decide, and evolve in our own intimate universes, the *Transformation* has created a new *Universe of Mind*.

so as to become New Citizens. One can say the word with confidence: *evolution.*

The Mind Networks

But all this spectacular economic, educational, and quality-of-life activity is dwarfed by the mind-blowing fact that these Intimate Devices are used by billions communicating in *mind networks*. That emergent behavior is exponentially more powerful than a single user accessing information. There are apps for that, and even multiple apps within those apps nested like Russian *matryoshka* dolls.

There is already a new "network" *Technique II*. Members offer integrated presentations utilizing learning theory. Part of the new technique is self-conscious distribution of modules of information, exploiting exponential growth of concepts. Catalysts are built into the interlocking software of platforms to spin out new structures. The new network *Technique II* includes another emergent behavior. By documenting our lives and each other's so instantly—and by even altering the course of our lives so as to more dramatically document them—society has become *New Boswellian*. We see our own reflections in the networks as we attempt to exploit exponential relationships.

Recently, a single message set off riots and international incidents, promoting further schism between cultures. But just as recently, an uplifting message was viewed more than 100,000,000 times in just six days. Millions of New Citizens on other continents are using their devices to build

Our New Complex

How thus should we conceive of the *Transformation*—that process whereby our current system is unfolding into a new foundational complex for the Third Millennium? And what is the butterfly that spreads its wings?

Certainly there is a different quality of life and new economic activity. New institutions are built as we speak. But new conceptual orders will also emerge: some locally, some nationally, and some outside of native tongues and cultures. All this is leading to evolution of thought about important issues of the day—including our health, values, quality of life, and very consciousness.

People now acknowledge they must devise a sustainable future. Because the new Universe of Mind is networked into the system of life by determining economic, technological, institutional, and cultural evolution, there are many arguments this is the *Big Pulse*. The next 30 to 50 years appear to be critical. Our new complex will envelop and facilitate Earth's remaining transformations as horrendous, wonderful, sublime, or shocking as they may be. It is up to us. Within this new Third Millennium complex, evolution will decide whether humankind passes a test of sorts. Such is the Transformation. It appears to be important. ◆