



**Excerpted from the book: FUTURE SMART
The Game Game-Changing Trends that will Shape Our World
By Dr. James Canton
CEO Institute for Global Futures
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The Future of Medicine: From Prevention to Regeneration

Flash forward to the year 2025, and let's see how disease will be prevented:

Before Cassidy was born her parents and her doctors knew there was a problem. Her doctors were alerted by their MedBot Clinic, an automated medical diagnostic cloud network application that took her mother's DNA sequencing and had been running Big Data and population health simulations to better understand any potential health problems down the road.

Due to a genetic flaw on her PV45 gene, which her mother discovered when she had her genome sequenced at the Apple iHealth Watch while updating her phone, they knew they had to take action fast. This gene carried a mutation that had demonstrated an immune deficiency, making her possibly susceptible to lung cancer when she was an adult.

Their DocBot at the Vitallife Center in Thailand contacted them over the mobile web with a predictive forecast. They had signed up for the Longevity Index when last in Thailand, getting great health care at

Bumrungrad Hospital, a leader in Asia.

They contacted the GeneTechs by mobile wearable at their health care provider, who had been monitoring her pregnancy. They already had been diagnosing and looking at gene therapy treatment models for her. The center was simulating a customized genetic vaccine to correct the problem before Cassidy was born. In 2025 predictive gene therapy was considered standard treatment to prevent illness.

Without this gene treatment Cassidy would live a compromised life with the risk of an immune disease. But now she had a greater chance for a normal, disease free life from the ravages of cancer. No other disease susceptibilities were found in the sequencing of Cassidy while she was in her mother's womb. She has a chance of a disease free life and a fresh start.

Predictive Medicine

Think about medicine today. It is reactive after an event. Most of the time we visit a doctor or hospital after we have a medical problem—a rash, lump, or nagging cough, for example. Unless due to an accident or an annual checkup, which too few people undergo, visiting the doctor today can still be primitive. You have an illness, rash, or cold. You visit the doctor, and he or she takes some tests to assess your problem—but this is the problem: by the time you have to get to a doctor, you already have a problem; your illness has already been in force. Medicine is reactive, not predictive.

Next, most of the diagnostics conducted, the tests taken to determine what your health problem is exactly, may take days before providing results. By then, unless a doctor can diagnose your condition quickly, you could be in trouble. Your disease advances.

Where disease starts, at the atomic or genomic level, requires a type of medicine that we don't presently have the tools to unlock. In fact, medicine today can do very little to predict your well-being or when

you might get sick. We are too far downstream to do prediction, so we have to wait for an episode to occur, to force us to go to the doctor. Imagine that this could be different, vastly different, and we had the tools to predict and prevent disease. Imagine how that would transform the very nature of what medicine is.

That is the future that we are headed toward shortly. When medicine becomes Future Smart, everything will change—not just health outcomes and quality of life but also the social, economic, and very fabric of our civilization will be changed when the Game-Changing Trends that are outlined in this chapter become a reality. And that future of medicine, one in which we are able to interdict, predict, prevent, and regenerate our bodies and minds, is just around the corner. The point is that medicine is still in a primitive state of development. We have not had the tools to fully understand disease, where it starts, why it occurs, and, too often, how to stop it. The mysteries of cancer are just one of the modern plagues we don't talk of that way, but the numbers make the case. Now, there has been over one hundred years of great progress in public health due to better sanitation, understanding germs, and antibiotics, which have saved millions of lives. Surgery and drug development today has advanced greatly since earlier generations.

But we are just discovering prediction, prevention, and the new forces of medicine such as stem cell therapy, bio-printing, and genomics that are emerging, all of which I shall cover in this chapter. We shall evolve from the primitive to the sophisticated in a short time span of ten years.

THE GAME-CHANGING FUTURE OF MEDICINE TRENDS

1. A fundamental shift in the medical model, moving from disease to prevention, to regeneration and longevity, will bring about radical changes in civilization.
2. 3D bio-printing will be used to grow whole organs on demand that will be commonplace, contributing to a medical revolution.

3. Stem cell treatments to cure and prevent disease will lead to a vast new future of healthy aging.
4. Robotic surgeons will operate with precision better than humans at the molecular, atomic, and genomic levels.
5. Regenerative medicine will provide the infinite rebuilding of bodies and brains, transforming the future of humanity.
6. Access to personal genomic data will forever change society, security, work, crime, education, and health care.
7. The coevolution of humans and technology through bio-enhancement will increase longevity, performance, and wellness.
8. Big Data science, the convergence of supercomputers and smart networks, will predict illness, simulate cures, and prevent disease.
9. Digital health, using apps, mobile, and cloud computing, will completely change how health care is delivered, providing vast new efficiencies that bring the information revolution into the hospital, creating a safer and smarter consumer experience.
10. Longevity Medicine will usher in a futuristic science of developing human potential beyond today's cognitive and biological limits of aging.

The Seven Revolutions in Medicine

There have been several revolutions in medicine that open the door to many new treatments. The First Medical Revolution, recombinant DNA technology, allowed researchers for the first time to “cut and splice” DNA, thereby making it possible to arrange genes in new ways in order to manufacture drugs or to understand the role that DNA plays in illness.

The Second Medical Revolution was genomics, which allowed researchers to rapidly sequence and manipulate gene sequence information, leading to the decoding of DNA, the map of life. Both recombinant DNA technology and genomics led to the formation of many of today's leading biotechnology companies. Genomics

continues to transform medicine. Availability Forecast: 2015–2020.

The Third Medical Revolution is in Big Data for medicine. The use of technologies to better understand the Big Data aspects of disease, to investigate patterns and population health, to understand geomedicine, and to use population health data has not only given us insights into disease but has also aided us to invent new care models. It has helped us to use data to build a personalized medical program for individuals leveraging DNA and other diagnostics. Availability Forecast: 2018–2020.

The Fourth Medical Revolution is digital health care. The use of mobile technologies, apps, and Electronic Patient Records to create efficiency and safety through networks, iPads, and wearable and web technology improves health outcomes and fosters collaboration among care providers to optimize our health. Availability Forecast: 2015–2020.

The Fifth Revolution is Regenerative medicine. This has the potential to be the next major revolution in biotechnology and will radically extend lifetimes. Due to the discovery of human embryonic stem cells, regenerative medicine has the potential to produce any human cell type, genetically modified in any way, to be used to treat a host of degenerative diseases. Stem cells will be used to develop customized new drugs, organs, and treatments. Availability Forecast: 2020–2030.

The Sixth Medical Revolution is health enhancement, to augment our health by applying prediction, prevention, and then treatments to upgrade our immune systems to resist disease, increase our cognitive functioning, optimize our body strength and organ functioning, refresh the neural plasticity of the brain, and enhance memory and mental agility. Availability Forecast: 2030–2040.

The Seventh Medical Revolution is to focus on longevity and antiaging, to prolong healthy life spans well beyond one hundred years
Designed Evolution. This includes the use of all of the previous approaches but also focuses on genetic treatments to design evolution

so as to combine longevity with disease resistance. With it we will move into the future, when nano, bio, neuro, and digital technologies are used to extend healthy, vital living. Availability Forecast: 2020–2050.

Medicine 2.0

Do you want to live an extra fifty years? How about eliminating an illness that plagues your loved one? What if you could live and be healthy until the age of 150? How about enhancing your memory, first to remember better and then to have a significantly higher IQ or just a total recall memory? What would you pay to lead a fit and healthy life, free from almost any disease? All of this and more is coming in the radical future of medicine. The huge shift will be from disease care care that you get after you get sick to life extension the prevention and enhancement of health.

This future is coming. The future of medicine, based on regeneration, rejuvenation, and restoration is coming at you fast. Nothing will be the same. Few people realize that this is going to be a dramatic and global shift in the type of medicine and health care people get. This will no longer be about going to the doctor when you have a problem; this will be more about preventing disease and even planning your life based on the enhancement of your health. This will be Medicine 2.0, well beyond what anyone can fully envision.

This future is already emerging in this era, but it's nothing like what's coming by 2025 and beyond.

The radical transformation of medicine is being shaped by what people want more than anything else longevity, life extension, to live a healthy and longer life, maybe even to live multiple lifetimes.

Advances in medicine will offer many new years to the normal lifespan, but the breakthrough will be in healthy aging and health enhancement. Most people, even doctors reading this, will doubt this

future of radical medicine is coming. We shall all be amazed at how fast medicine changes to embrace the new innovations that biotechnology, regenerative medicine, and preventive medicine will offer lifestyle choices for humanity that all will embrace.

I can predict this trend not just because of the fast future of technology that is emerging but also the consumer demand that is the real motivation. Who doesn't wish to live longer, cheat death, and have more time to spend with their loved ones, have the time to create or enjoy life? Who doesn't want to have a predictive capacity to know their health future and be able to enhance, change, or alter their health future to live healthier and longer?

When these tools are available and we can achieve the outcomes of healthier and longer life spans, I predict it will change the dynamics of civilization. Societies will rise and fall based on who has access to these advanced human enhancement technologies that will transform medicine. Welcome to Medicine 2.0.

Death to Aging

Is there a reason we need to accept the usual seventy to eighty years and then die? Is there a reason we need to accept death at all? Radical, even disturbing, ideas about the future of humanity are emerging on the horizon in which aging and even death is challenged. The complications and ethics of who gets access to antiaging for example, who lives and who dies will be debated in the twenty-first and twenty-second centuries. This quandary is inevitable in a world of radical innovations that suggest we can age healthy and live longer, much longer, even as some think immortality is possible, as bizarre as that may sound to most.

In many ways this future is now. If you are over forty years old and are currently taking pharmaceuticals to prevent or treat high cholesterol and blood pressure, we can predict you have eliminated the risk of a

heart attack or stroke by 30 to 40 percent. If you now add that if you do not smoke, drink alcohol, or use drugs irresponsibly or if you are not significantly overweight, we can predict you have eliminated another 30 to 40 percent from your risk profile.

This combination of a healthy lifestyle and taking pharmaceuticals that manage heart disease risk give you more than a 60 percent chance of health and longevity. Now, in all fairness, if you are under high stress, due to your lifestyle and work environment, and you have genetics that put you at a certain risk for a genetic disease, then the odds may not be as favorable for a long and healthy life, but you are still doing better than the person who is doing little.

The point is that today I can see the emergence in slow steps, new discoveries, and substantial progress that innovations in science will use to change medicine, and this will change our civilization. You will want this future. You will demand this future. And you will get this future.

The innovation explosion altering medicine is the most radical revolution on the planet. By or before 2025 medicine as we know it will have completely been transformed. Today we are witnessing a profound change in medicine, in which science is so far outpacing governments that the innovations are being held up except in the most Future Smart economies.

Science into stem cells has begun, but by 2020 discoveries will be known everywhere. Regenerative medicine will have altered the status quo so much that in 2025, the idea of health care will be forever changed. It will be immoral not to use stem cells to regenerate and rejuvenate people.

Life-Extension Technology: 2025

***Wireless Diagnostic Scans Detect Disease Prebirth DNA Sequencing Required
Childhood Genomic Vaccines Now Free***

Headlines from the Future: 2035

***Nano-Implants for Memory Enhancement Restore Memory Autodesk's Bio-Printers Sell Out as Orders Outpace Supply Apple's iPersonal Health Monitor
Predicts Your Health Future Health Enhancement Market Is Worth \$2 Trillion***

The End of Medicine: Predicting Your Health Future

The end of medicine is coming close. This means that the very model of what we do in medicine must and will change. A new type of medicine is emerging.

A revolution in how we even think about medicine is emerging. The big shift in medicine will be from disease care to prediction and then from prediction to prevention. Finally the end of medicine will be the rebirth of medicine regeneration and longevity medicine.

This will force medical schools, hospitals, doctors, and governments to change their resources and train a new generation of medical technicians and doctors to manage public health and wellness, not just disease. When you can predict the health of a person or population you can change the outcome by applying prevention to stop the emergence of disease.

This is a radical concept that we do not have the science today to do fully, but in the future, within ten to twenty years, we shall be able to move medicine more completely into predictive and preventive services.

This revolution in medicine, the emergence of regenerative medicine, has at its core the capability that a number of other animal species already have. Salamanders and star fish rejuvenate their limbs, growing

new limbs and tails by an instinctive programming of their cells it says grow this when they lose a limb or tail.

Humans are learning how this mechanism of regeneration works, and we have focused on a particular type of cell that holds the potential for transforming medicine embryonic stem cells. These cells can become any cells, tissues, or organs in the body.

This is a huge evolutionary step forward for humanity. Unlocking this mystery would eliminate most disease yet also lead to a troubling possibility enhanced humans who live longer, perhaps could be immortal, and who have enhanced intelligence and immune-enhancing superhuman competencies. This represents a slippery slope that could harm or help humanity or, more likely, do both at the same time.

Why, you may ask? Today, in this time, disease is the focus of medicine. Doctors are trained and hospitals teach disease care how to understand, treat, prescribe, and manage disease. The idea that medicine should focus on health and wellness in reality, the opposite of disease is just not taught or what doctors are trained to do. They know it. But if you ask a doctor, as well meaning as they are, they will say, "Of course, my job is to cure your disease." But the invisibility of their focus, on disease, has much to do with why medicine has gone astray. Not to worry. Regenerative medicine is the future of medicine.

Are there many other innovations that could be described as such, perhaps?

Certainly genetic engineering, translational medicine, digital health, and Big Data are some of the key trends in medicine, but none will transform medicine alone. Regenerative medicine, the treatment and use of stem cells, will transform medicine along with millions of lives.

Stem cells fall into two categories: embryonic and adult stem cells. The stem cells that have the most potent impact are embryonic stem cells.

Stem cells appear to act as Universal Healing Agents. Stem cells may be a universal treatment and have the best shot at defeating disease.

Stem cells are the fundamental building blocks of the body.

They can be reprogrammed to grow into specific healthy cells. Added to a diseased heart, lung, liver, or kidney, they can grow new cells. They rejuvenate and regenerate new healthy cells, tissues, and organs. This is a big deal if you want to live forever or if you just want to survive the ravages of old age and disease.

There are over five thousand clinical trials to fast-track stem cell treatments so they can move into the clinics to treat disabled, dysfunctional, and diseased patients. Regenerative medicine will forever change patients' health and, even separately from the rest of the arsenal of new medicine, enhance the health longevity of millions on the planet.

Headlines from the Future: 2025

***Bio-Mods Make You Smarter Smart
Drugs Now Available Human Augmentation Jobs Exploding Cognitive
Enhancement Level-3 Required for Jobs***

Regenerating You

At the World Stem Cell Summit in San Diego I met with many leading researchers who are developing the future of medicine. The leading clinics and centers of research into the use of stem cells from the United States, Asia, and Europe demonstrated just how fast this technology was moving. Leaders from Harvard, the Mayo Clinic, the University of San Diego, and others have been reporting breakthroughs in the use of stem cell therapies since 2004. Livers, eyes, hearts, and numerous diseases are being "regenerated" by stem cells, which literally grow healthy tissue and organs as well as regenerate and make for healthy immune systems.

In fact, most people don't realize the massive societal changes coming when not only can we fix our cells or organs but also eliminate many diseases out right. Most people don't realize the global shift in society when we have Enhancers, evolutionary advanced humans on the planet.

But I am getting ahead of myself here.

Acme Regeneration 2030: More Human Than Human

***Current Price List Kidney: Free with insurance
Heart:\$1,500 / Knee:\$400 / Liver:\$500 / Lungs:\$800***

The ferocious planetary transformation that regenerative medicine represents cannot be underestimated. We will eliminate most disease, enhance longevity, and shift the balance of power in ways no war, economics, or technology could ever do. Some believe we will eliminate aging. We may be looking at the end of medicine. Medicine's core goal is to eliminate illness and promote health what happens when medicine succeeds? This is the End of Medicine. This is a new era of medicine regeneration, longevity, replacement. This is a radical new science that does not exist today but will in the future the End of Medicine and the New Future. Now that sounds like a tall order, but this is a forecast that is at the core of this book fantastic trends are coming so quickly and will cut so deep that no one today is prepared for what's coming.

It is simply not possible to read this chapter and not be motivated to prepare for the future that is coming faster than the speed of light. And that is slow compared to what is coming. There are no changes that best characterize Future Smart than what is happening in medicine. Radical change, massive innovations, new tools, and fantastic new discoveries are moving out of the world of sci-fi and into reality faster than anyone can imagine.

Headlines from the Future: 2030

3D Bio-printing at Affordable Prices Nano-Replicators No Organ Too Large or Small Don't Forget Upload Your Memories with GoogleMind LifeXtend Insurance: Because You Are Going to Live Forever

Regenerative medicine's aim is to stimulate the healing capacities of the person through the use of one's own cells. This is the full circle that will shape the future of medicine and, most important, offer authentic life extension to individuals for the first time in history. The use of stem cells from an individual, for example, to treat that person will be a radical departure from what we do today in medicine.

Rebuilding humans with refreshed, newly grown organs will change the world in fundamental ways that are hard to imagine, but this future is coming faster than you think. Some think that the endgame of regeneration will be immortality. Life extension will be a commodity that can be delivered in a world where rebuilding organs, tissues, and, ultimately, humans will become the largest industry in the future. There may be a radical type of life extension that, due to medicine's rapid innovations, is no longer considered "human" but rather posthuman. Posthuman life extension would refer to humans that have accelerated their mental, physical, and perceptual capabilities so that they transcend the normalcy that we associate with average humans.

We will perceive them as radically enhanced, different, even alien from us. In some nations Posthumans will need to be regulated by laws that protect the Naturals from the Enhancers. International law will be enacted to ensure both the human gene pool and rampant hybrid evolution does not disrupt human biology and society.

This is a vast area of global science and law policy that will shape the future of our civilization, affecting the far future of humanity and our civilization. Our capacity to enable, direct, and accelerate human evolution with the scientific enhancement of minds, bodies, and genes will be a temptation we shall not be able to resist, and this will be a

major shift in our civilization.

Enhanced Humans will work with more of their potential, manage more complexity, think and act faster, perceive opportunities clearer, and manage problems and information more accurately than normal humans. The enhancement of genetics, cognitive functions, and even merging of human biology with computing devices or networks will play an important role in this emerging Posthuman development. These Posthumans may exhibit capabilities to also connect directly and wirelessly with computers, machines, or networks and operate mentally and physically with speed and capabilities that we would call of an advanced nature beyond what humans are capable of today.

This forecast will come into reality not just when we have the insights and technology to radically enhance humans but when society requires such Posthumans to solve the complexity of problems and challenges that we now face and shall face in the future. Who would argue that the complex problems of climate change, new energy, poverty, and war that face our present could use advanced computing intelligences, AIs, or advanced humans to solve? Perhaps this is the Posthuman endgame that waits for us in the not-so-far future from today.

Perhaps human destiny is fated to leverage human enhancement as well as the harnessing of Smart Machines to truly make a better world and a more equitable, prosperous, and secure future. This would make sense and give purpose to the coming convergence of humans and technology. Without adequate guideposts of law, ethics, freedom, peace, and security to guide the awesome scientific and technological innovations that are swiftly approaching our civilization, we will be led astray in the “shiny new thing” mentality. This forecast could also lead to unintended risks we should be aware of.

Health Clouds and Big Health Data

In the near future real-time diagnostics and consumer diagnostics will change health care by creating velocity and precision. Many health problems may be addressed by having the right information about the patient or condition to understand the problem. Getting the right tests to capture the right information about our condition and getting that personalized information to the right professionals is paramount to the future of medicine.

Most health care will be delivered through wireless cloud computing networks, health care beamed to us wherever we are on the planet. In fact, a global Medical Global Center will have the ability to beam health care, diagnose, and receive exabytes of information in patient information, X-rays, and even medication and procedures. The future of medicine is wireless health clouds that are tied to the best humans, computers, and AI that can prescribe, diagnose, prevent, and treat, in real time, the 8 billion humans on the planet.

eHealth Apps: 2020

Monique, Your Personal Health Avatar watches your diet, drugs, and keeps your health updated

Healthy Heart Scan real-time heart monitoring Diet Design the leading genomic trading DNA Updates news about your DNA conditions TeleMed Alert your real-time telemedicine link to customized care Kids HealthMind all about your kids' health; monitors your kids Siri Medical Scout AI decision support for everyone on medical info DNA Trader site for buying custom genetic vaccines, research, and fixes MedEnhance leading info on drugs and devices that will enhance your mind and body.

Medicine 2.0

Jobs Wanted: 2025

Other than the profession of medicine that will change, forever altering what doctors perform as medicine, the largest changes will come from new occupations of medical specialists who will provide health care direct to patients from non-doctors. Here is a list of potential new jobs in the future of Medicine 2.0:

Big Health Data Programmers

Personal Mind Fitness Counselors Life Extension Project Leaders Genomic

Disease Searchers

Regeneration Health Specialists Population Health Forecasters Life Extension

Economists

The Rise of the Medical Entrepreneurs

Calling all Medical 2.0 Entrepreneurs. Here is what you need to know to get involved in the revolution in medicine. First off, you don't need to be a doctor to be a Medical 2.0 Entrepreneur or innovator. But you do need to know what's coming, the trends that will shape this new marketplace. Thousands of new companies will be born from these new areas of innovation. Thousands of new opportunities in medicine will come from identifying, managing, packaging, and analyzing the information, medical informatics, that will make medicine better. There is a historical precedent for this.

The London cholera epidemic of 1854 was a breakthrough in analyzing data in order to understand who and where patients were getting sick. This helped authorities isolate a public health source, the water pump in the Soho district of London, as the source of the cholera. This data analysis was focused on disease and thinking entirely differently about the geography of disease where people who were getting sick were living.

Today, with mapping geo-intelligence, understanding the maps of

genomics, geography, neuroscience, and a score of other tools, we can begin to unravel where disease begins. But in the future our tools will be greatly increased, enabling us to understand where disease begins, either from biology, environment, genes, or behavior, but also, and most important, we will focus on wellness, preventing illness, and enhancing health. This is the Future Smart breakthrough that is coming, and it will redefine aging, health, and disease. We will have many more lifestyle options in a world where being 150 years old is not unusual. Are you ready for this future?

Medical Entrepreneurs on the Leading Edge SMARTER DIAGNOSIS

A leading-edge innovation to analyze skin cancers without having to conduct a biopsy to skin cancer was developed. The handheld tool created by MelaFind (www.melafind.com) is an optical scanner a doctor can use to provide additional information and determining whether to order a biopsy. Its goal is to reduce the number of patients left with unnecessary biopsy scars, with the added benefit of eliminating the cost of unnecessary procedures.

The MelaFind technology uses missile navigation technologies originally developed and funded by the Department of Defense. It optically scans the surface of a suspicious lesion at ten electromagnetic wavelengths, and the collected signals are then processed using computer algorithms and matched against a registry of ten thousand digital images of melanoma and skin disease to help doctors make better decisions.

SELF-CARE WITH BIOSENSORS

Diabetes self-care is painful, as all patients know. This care requires the daily and frequent need to draw blood for glucose testing as well as daily insulin shots. There's a new innovation from Echo Therapeutics (www.echotx.com) that would use biosensors within a patch. This transdermal biosensor will read blood analysis through the skin, without the need to draw blood. With the help of a handheld electric toothbrush-like device that removes just enough top-layer skin cells to put the patient's blood chemistry within signal range of a biosensor embedded in a patch, a person experiences less pain and better results.

YOUR ROBO DOC

Tele-robotics is being used to provide health care to rural regions of the United States, connecting people to medical centers and their specialists. Telemedicine is well established as a tool for triage and assessment in emergencies. New mobile bots can now roam hospitals and visit patients actually make routine rounds, checking on patients in different rooms and managing their individual charts and vital signs without direct human intervention. The RP-VITA Remote Presence Robot, produced jointly by iRobot (www.irobot.com/us) and InTouch Health, is the first such autonomous navigation robot to receive FDA clearance.

NANO-TUBES TO THE RESCUE

Who knew that a rapid and inexpensive test created last year by fifteen years old Jack Andraka could one day enable early detection of pancreatic cancer? The test uses carbon nano-tubes laced with an antibody that reacts to a protein, mesothelin, that is found in the blood of people with pancreatic cancer. The simple test could save lives by conducting an inexpensive and noninvasive early detection test.

DOCTOR WATSON WILL SEE YOU NOW

IBM's most ambitious project is best known today as Watson. Named for IBM's founder, Watson, is IBM's investment in the future of IBM and perhaps the rest of us as well. They are making a huge billiondollar forecast that a type of supercomputing called cognitive computing will make a significant impact on civilization, and they are starting with health care.

IBM believes Watson can improve care and lower costs by identifying the best treatment option by analyzing the Big Data of Medicine, which is yet to be unlocked the millions of research studies and patient records.

IBM is working with leading hospitals and health care clients to embed Watson into health care. But this is the difference: Watson has to learn first what it means to deliver care. So Watson is learning so it can evolve to actually deliver decisions that will help to diagnose patients. This is quite extraordinary a computer that can diagnose disease.

When first announced, there was a public outcry from the media and even doctors: no supercomputer can diagnose people's diseases that is absurd. But that is exactly the future of medicine. In fact, I predict that supercomputers like Watson will be used to both back up as well as enhance doctor's decision making and, eventually, be used without doctors to both diagnose as well as design and customize treatment programs.

Watson is based on a new type of supercomputer that has the ability to crunch terabytes of data, billions of information bits about research and disease, so it can learn how to solve disease as problems. This approach, to teach supercomputers how to think for themselves, is an awesome goal that has implications well beyond medicine. Prediction: we will be building the next generation of thinking machines that outpace even outrun. They will be faster and smarter for many jobs

than humans. In medicine Watson is learning and evolving into a Doc in the Box in fact, that is the goal.

When it comes to medicine humans make too many mistakes. In the United States alone over one hundred thousand people die of mistakes and errors in hospitals due to misdiagnosis and being prescribed the wrong treatment

or medicine each year. This number in the United States is low it is likely over 100 million. Worldwide but realistically, everyone in every nation could benefit from technology being used to minimize errors and get the right drug or treatment to the right patient at the right time.

Digital health technology could save billions of lives over a generation. Getting the right medical information to the right people who need it in time could make the difference in over 1 billion people's health today.

With an increased population, of 1 to 2 billion more on the planet within fifty years, this could make a difference of 3 to 5 billion people who could be healthier or even just survive.

Watson today is working with the University of Texas MD Anderson Cancer Center to build an online tool to help suggest the best cancer treatments. Watson would learn, from analysis and patient data, what worked best not only for different cancers but also for different types of patients, with different genomic profiles, demographics, geographies, age, and health statuses. The amount of information this type of data mining or what we will call Longevity Medicine in the future today could not be analyzed or cost effective to produce by any doctor or researcher, as it would not be complete.

NULIFE BIO-ENHANCEMENT SERVICES OFFERED: 2025

1. High Cog: fast memory recall; advanced IQ insertion from Noble Prize Winners' DNA; good for engineers, scientists, and inventors
2. Body Boost: can be added to any genetic package, best if inserted genomically BB (before birth); enhanced sports capabilities
3. SmartX: an inhaled nano-device that can be programmed to seek and neutralize disease pre-expression at a Level Pre-One Alpha before disease emerges
4. Deep Think: enhanced language, logic, and conceptualization of complex ideas, theories, and philosophical constructs, enabling a higher order of cognitive problem-solving functionality
5. Transcend: a custom pharmaceutical that enables a sophisticated human to link with machine collaboration
6. INSync: a relationship drug that enhances your emotions by releasing hormones that enable deeper communication and collaboration with your partner
7. RelaX: for the harried and stressed-out person, the Type A personality who needs to relax and unwind at the end of the day

By 2025 Watson will have been an early pioneer in what will have become a generation of cognitive computers that learned medicine, first to advise doctors, then to advise patients, and, finally, to diagnose, treat and operate on humans with and without doctors: enter the SuperDocs. These will be what we think of today as AI, the Doc in the Box.

They will be super-intelligences that are a new class of computers really, network intelligences based on evolutionary computing, virtual intelligences that provide exceptional and extraordinary services for humanity, solving the biggest challenges we face. Someone will have to program, envision, and build these SuperDocs. This is the game-changing future of beyond medicine.

The future medicine will be altered in the near future by these Mind Machines that will travel through networks like the Internet, providing health care and treatments to the people of the world, where the Doc in the Box will always be available and ready to heal, diagnose, and treat

the billions of patients in the world. Watson is an early step on that journey to building smart cognitive machines that will help humanity evolve.

More innovations will shape the future of medicine over the next five to ten years than have in the past hundred years. Are you ready for this massive set of trends and the opportunities that are coming fast? If I were looking for a new, exciting, and dynamic industry with fastchanging and lucrative opportunities for innovation and as a career, I would seriously consider the future of medicine as I have outlined here. In fact, I have made investments in biotech because of what I have predicted here in this book.

Headlines from the Future: 2025

Studies Show Consumers Prefer Virtual Doctors

The Pews Study on Digital Medicine and Patients revealed that over 80 percent of patients polled preferred the care and bedside manner of their Digital Docs over human docs. “The levels of emotional intelligence, care, and kindness as well as the proficiency of Digital Docs has again signaled that we may have gone too far in creating the perfect doctor,” said Dr. Shultz from the American Medical Association. The Digital Doctor Association, the DDA, made a statement that digital doctors look forward to working closely with humans, both doctors and patients, to make this a healthy world.

Scott’s RoboSurgery: 2025

Traveling in East Africa on safari was always Scott’s dream, so early in 2028 he and a few of his buddies from college left for the journey.

Scott was not three days into the trip when his knee collapsed in a fall, and he was sure he tore some important ligament.

With no doctors or hospitals for three hundred miles and no way to get there safely, he was stuck. Luckily he was a patient of the GlobalMed Grid, the virtual medical clinic based in San Francisco but was global doctors were in thirty nations and all online.

Because every device and phone was now online since 2020, he was able to connect to a doc, who quickly analyzed a picture Scott took and sensor diagnosed his knee with his smartphone app. The sensors revealed the tear was not serious, but he did need surgery now.

“Not to worry,” stated Dr. Mobutu. “We have a medical drone on its way with the exact robo-surgical bit I need to fix you up, mate.”

Within forty-five minutes the drone found their remote location and attached the bio-bit to Scott’s knee. Dr. Mobutu had said it wouldn’t take long, and he then virtually operated the bio-bit, fixing the torn ligament with a wireless interface, a type of laser scalpel. After the surgery, which was wireless and noninvasive, the doctor predicted a quick recovery. “Fit as a fiddle in two hours,” claimed Dr. Mobutu. “Good day.” Scott was back in action on safari.

The Enhancers: 2035

A secret society of scientists and patients decided to accelerate research into new areas rather than be slowed by government regulation. The Enhancers emerged, developing gene therapies, diagnostics, new drugs, and cybernetic augmentations to defeat aging but enhance their intelligence.

This global group of concerned investors recognized that the full potential for stem cells and genomics could enhance human beings’ cognitive, muscular, and physiological performance. Their investments, well beyond what governments were contributing, led a revolution in human enhancement of mental and physical attributes, some considered superhuman.

Longevity Medicine

Somewhere around 2020 we will have the tools to reinvent medicine. I call this Medicine 2.0, but it is a distinct change in the very nature of what healing and medicine has conducted in the past. You see, medicine in the Western world has always focused on healing, on disease. We treat the disease with drugs or devices or we cut it out. And most of the time this worked fine to treat disease.

Consider cancer. If your cancer can be surgically removed, then great, let's do it get rid of that cancerous cell growth. If we can kill off the cancer with drugs or radiation, and if you survive this ordeal, then, well, that is perfect. This is the standard of care today for cancer simply put: treat it or cut it out.

Now imagine a different future of medicine. We can predict when your healthy cells might start mutating to become cancerous. We are able to identify a gene that we associate with cancer and imagine we can analyze your health forecast even before you are born or shortly thereafter. Then you undergo a genetic treatment to correct that gene so it will not express cancer in the future, we have now prevented cancer from emerging. This is one part of the future of medicine that is coming.

Imagine further that you are monitored by a diagnostic automated medical avatar, that scans you wirelessly every day. It's a cloud network or app from your phone. It watches and monitors your health, sending personalized health data to your doctor, who has it analyzed by a supercomputer, like our friend Watson, who notices a change in your biochemistry associated with a type of diabetes, your sugar levels have gone up, or a genetic expression has occurred that is associated with a heart attack.

At that moment care is automatically sent to you wirelessly to ensure your health is protected and your illness is interdicted before a crisis point erupts and you are off to the hospital with a serious illness. This is the future: the use of wireless and digital health monitoring to

predict, prevent, and treat disease.

Longevity Medicine is about the evolutionary shift from disease to wellness, from prevention to enhancement, toward a new type of medicine that does not exist today because doctors do not have the tools and technologies or the vision of what medicine could be they are still in Fix-It Mode. Prevention and prediction are emerging slowly. Regeneration is not out of trials yet. Enhancement is the black box of experimentation, well off Main Street. Much of this future has not and will not happen for five to ten years for the mainstream of society, but there are those Future Smart leaders who see where this is going and are on the leading edge of the future.

The final game changer in medicine will be Designed Evolution where medicine and biotech and then evolutionary biology collide. This is when we shall have the power to alter not just enhance human performance. We will be able to change the evolution of human bodies and minds in order to reach a new level of quality of life, even consciousness, beyond health and disease.

Synthetic biology is a recently emerging field that applies engineering technologies to design and construct new biological parts, devices, and systems for novel functions or life forms that do not exist in nature.

Synthetic biology relies on and shares tools from genetic engineering, bioengineering, systems biology, and many other engineering disciplines. It is as much a design science as a new force in medicine. The ability to quickly and reliably engineer many-component systems from libraries of standard interchangeable parts is one hallmark of modern technologies. Whether the apparent complexity of living systems will permit biological engineers to develop similar capabilities will take years to determine, but the potential looks promising.

The vision behind this science is that these biological “parts” can be joined to create engineered cells, organisms, or biological systems that reliably behave in predictable ways to perform specific tasks. Synthetic

biologists eventually hope to be able to program cells, cell systems, or organisms to perform specific tasks and functions.

More recently scientists have developed techniques to more efficiently synthesize or modify larger segments of DNA, marking a significant change in the way people study biological systems and a growing capacity for both experts and amateurs to manipulate such systems.

In May 2010 researchers at the J. Craig Venter Institute announced that they had produced major breakthrough in genomics, with the impact on medicine to be vastly important: the first functional, self-replicating, bacterium whose entire nuclear genome had been synthesized artificially in the laboratory. This is the second step, with the first being the decoding of the human genome, of which Venter, a world-class scientist, led the team that “broke the code” by mapping his own DNA. If we can design and produce artificial cells, the implications for a new era of medicine can be seen not far in our future.

Artificial cells, organs, and bones as well as Synthetic DNA will be used to regenerate humans to defeat aging, making the Longevity Marketplace, of immense value to humanity. Medicine’s New Future will be in creating an entire Medical Supply Chain to support longevity, regeneration, and the medical enhancement of human health and human beings. This will lead, as I have forecasted, to a new civilization that not only eliminates most diseases but also, therapeutically and then radically, alters human evolution, making humans able to live much longer and be healthier and smarter.

Medicine in 2030 shall be unrecognizable compared to medicine in 2020 due to the amazing game-changing innovations that will emerge. The accelerated future of innovations that are revolutionizing medicine from nano, bio, neuro, IT, and quantum will reach a Convergence Point, at which even more high-velocity innovation will emerge, beyond what we have seen so far in this century.

Medicine Evolves

The evolution of medicine is happening faster than we could predict.

Adult stem cells are now being shown to grow organs. Artificial cells can one day cure illnesses. DNA diagnostics gives us a predictive map of our future health status. We may learn to embed nano-devices inside the body to deliver drugs. We may learn to refresh the mind with genetic vaccines. This is a map of how medicine will evolve based on my forecasts. Over the next twenty-five to thirty years the completion of the final stages will transform the very purpose and practice of medicine.

Medicine 2.0 will be so completely different in ten years from today that a doctor from 2014 would not be able to practice medicine without being retrained. Medical schools will need to throw out the textbooks, rewrite the curriculum, and move medical education into the cloud to be able to change the courses in real time to address these Seven Stages of Medicine 2.0.

Medicine as defined here will use a combination of computing, pharmaceuticals, medical devices, and treatments to diagnose, prevent, and rebuild the human body and mind. A new integrative medicine that builds on discoveries will phase into medicine what is needed to better understand how to extend health and turn off disease.

The reference to enhancement is to predict that, after we learn to fix or heal, the same technologies will be used to augment, enhance, and develop human potential to perform at a higher level of mental and physical fitness, quite beyond what we consider normal performance today.

I envision a future when the focus of care shifts from disease to life extension and, finally, to enhancing human health and longevity not just living longer but being healthier and more capable of developing human potential for creativity, innovation, discovery, and enjoying life.

Here are the stages that will unfold:

1. Disease management: today's medicine
2. Predictive analytics: understanding through genetics, digital health diagnostics, wearables, data, behavior, and environment how to predict and diagnose disease and health
3. Personalized prevention: reprogramming disease, self-care, enhancing health at the genomic and atomic levels.
4. Regenerative medicine: stem cells, gene therapy, and nanotechnology used to restore and regenerate wellness
5. Human performance enhancement: augmentation of human potential for developing advanced mental fitness, mobility, and perceptual capabilities
6. Longevity Medicine: significant healthy life extension, pharmaceutical and genetic prevention, living a vital 150 years
7. Evolutionary Design: advanced synthetic biology, genetics, and regeneration for maximizing optimal longevity, enhanced mobility, and cognitive enhancement; augmenting intelligence, human cybernetic enhancement

Longevity Medicine 2030: The New Wealth of Nations

By 2025 it will be clear that medicine had forever changed. The enhancement of human beings, beyond healing disease and fixing problems, was possible. The emerging regenerative medicine field had become a global trend. Not solely driven by scientific breakthroughs in what was possible to cure disease, stem cell treatments could also be used to enhance human performance and longevity, now recognized by nations, corporations, and individuals to be a strategic competitive advantage.

I have not done justice to forecasting all of the details that are coming quickly in the future of medicine, but I have focused on what are the game changers, the top drivers of change that make this trend so fascinating and dynamic.

Ethical Future Challenges

Medicine touches us all. And with so many trends converging on our world so quickly, being Future Smart about the future of medicine might benefit you as a person, making you healthier and living longer, but the entrepreneurial opportunities will be just as large. From digital health to regeneration, enhancement to new diagnostics the future of medicine is coming fast.

The key trend I have sought to convey is that as we learn to predict, eliminate, and manage disease, our civilization will be altered in fundamental ways. How different will our world be when health enhancement becomes a deliverable and lifetimes are radically extended?

These challenges that we shall face, that are emerging now, will require a completely different set of rules: who gets enhanced, who does not. What are the politics of enhancement, and how might societies compete over enhancements?

The ethical challenges of the future, brought by medicine at first to heal and then to enhance, will change human evolution. Ideas and debates about transhumanism, being beyond our current human state, will become more obvious. Synthetic biology, regeneration, genetic therapy the convergence of these fields will transform medicine into something vastly more potent than a social service.

The very profession of medicine to extend lifetimes, end aging, and bestow beauty and intelligence will remake medicine. Our civilization will be forever transformed in a future that is coming faster than most realize and will challenge our ethics and even our concept of what type of future world we want to create.

We will have crossed the Rubicon toward enhancement, with healing behind us. Perhaps this is our evolutionary destiny to cheat death, end disease, and hack our own evolution by leveraging these innovations.

But I can state that medicine in 2030 and in the Far Future of 2100 will

look nothing like what it looks like today. Just as enhancement has today enabled humans to see with contact lenses, manage their heart disease with drugs, and replace hips and knees, enabling movement, tomorrow we shall do so much more in the New Future.

Prediction. Prevention. Regeneration. Enhancement. Longevity. This is the New Future of medicine.

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