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A W R I T E R ' S  
M A N I F E S T O

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M A R K H E L P R I N

*Author of Winter's Tale and A Soldier of the Great War*

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# DIGITAL BARBARISM

*A Writer's Manifesto*



MARK HELPRIN

 HarperCollins e-books

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I am all for your using machines, but do not let them use you.

WINSTON CHURCHILL

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היום הסורימ הולכימ ללמוד שהקו בין דמשק לתל-אביב, הולך גמ בין תל-אביב לדמשק.

- משה דיין

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## P R E F A C E

Even were this book to begin in medias res, which, as an essay-memoir, it does not, a reader might benefit from a brief guide to the terrain it covers. This is especially so because of the chapter titles, which until the chapter is read and despite their subtitles, are for the most part opaque. In a conventional policy book you will not likely find a chapter entitled “Death on a Red Horse,” or one, the last, called “Parthian Shot,” which refers to an archery maneuver the ancient Parthians accomplished while retiring at full speed on their horses.

But in this book you will. That it is partly a memoir is not least in service of a principle it espouses—that man need not model himself, the way he lives, and by derivation even his arguments, after machines. In its complexity, mystery, intelligence, and beauty, humanity is unexcelled as a masterwork of God and nature. Why then must its qualities be filtered from argument and cleansed from reason as if they were pollutants?

We believe our nature to be, in the literal sense, primitive, lacking in grace and precision, unedifying, something always to be conquered and overcome. But think of the most complex and extraordinary machines mankind has yet devised, take ten of them, and combine their virtues. This tenfold construction—in terms of exactitude, critical timing, coordination, variety, miniaturization, adaptability, calculation, sensory function, integration, and balletic precision down to the atomic level—is neither a billionth as complex nor a billionth as wondrous as the very least among us. The most afflicted, deformed, and unconscious are yet miraculous by virtue of the human nature that, in imitation of the machine, we mistakenly strive to exclude from our deliberations.

It is both strange and unnecessary that we do so, given that the strongest expositions and appeals in history have come from the likes of Dante, Shakespeare, Milton, Montaigne, Lincoln, et al., who made use in them of the astonishments, beauties, and even the imperfections of our mortal nature. Thus, memoir to illustrate argument, so as not to rank the works that we have made above the work that we are.

Necessitated by that, and by a life (my own) spent writing fiction, is an obliqueness uncommon in modern nonfiction, a trust that the reader can, according to Shakespeare's exhortation, "by indirections find directions out." In my view, a reader is not something that pops up in a game of Whack-a-Mole,<sup>™</sup> repeatedly to be hit over the head. If you are not Ann Coulter (the love child of two cellophane noodles), or Al Franken (the love child of a bratwurst), you need not be compelled to write like them.

When I was younger I would sometimes write speeches for politicians—except in two cases when the agreement was broken, always from deep anonymity and always without any compensation except a chance to view the horrible workings of government up close in the short space of time between my entry and my dismissal. It was difficult, in fact impossible, to convince most politicians that substance and style, strengthening one another ineffably, are inextricable and organic. With no further addition, the substance of something that is beautifully conveyed magically increases; and something that is conveyed beautifully shines all the more if it is of great substance. Although one always knows when it is there, the superior conjunction of these two elements is invisible. Thus the attraction, other than its encouragement of civilized reticence, of the oblique. And thus its powers.

What follows is an affirmation of human nature versus that of the machine, via a defense of copyright, the rights of authorship, and the indispensability of the individual voice. Of late, these have come under sustained attack. A movement that, whatever its ideological origins, finds its most congenial home and support in the geek city states of

Silicon Valley, has successfully channeled and combined the parochial interests both of giant corporations and legions of resentful adolescents who believe that they have a natural right to whatever they want. It is known informally as the “Creative Commons,” and the charitable mask it presents, selfless people contributing their work—software, music, writing—to the common weal, is merely the cover (not much bigger than a postage stamp) for a well organized effort to cut away at intellectual property rights until they disappear.

Its driving force, its Concord and Lexington, was the clash between youth who suddenly found that they could freely obtain all the music by which more than any other group they live, and the record industry, which attempted to stand athwart the flood of new technology and shout stop. The young people and their tools won, and the record industry has been transformed and diminished. In the face of a movement energized by victory in its first battle and enabled by technology that develops almost faster than anyone can assimilate it without altering his mental processes, intellectual property rights do not anymore enjoy the presumption either that they are justified or that they will endure.

That their decline or disappearance would benefit Google, large swaths of the academy, and “content sharers” is without question. But, as in a crowd looting a supermarket, or a junkie taking a hit, the surge of well being would be only temporary, with deprivation following on as the many threatened engines and instruments that supply the things that people would loot began to die. But despite the fact that (as illustrated by price controls or planned economies) when everything is free there is soon precious little or nothing of it, the attack continues apace. In a world turned upside down, indignant violators of copyright, abetted by tax-exempt “public interest” groups, aggressively sue copyright holders. The tide of opinion, driven by the internet, is running now largely against the idea of intellectual property, if only because relentless winds of propaganda state that to defend it is selfish and retrograde. Even at the risk of appearing selfish and retrograde, I defend it here.



The first chapter, “The Acceleration of Tranquility,” views without rancor the deeper elements of contention, which at its heart is an argument over different visions of the world. In it, we travel both with a British statesman to Lake Como in 1908, and by the side of a master of the universe in 2028—to illustrate where we are now and where we might choose to be.

The second chapter, “Death on a Red Horse,” is trench warfare, blow for blow, involving the foot soldiers and some of the low-ranking officers of the armies drawn up against the rights of authorship and the individual voice. It begins with an incident of childhood and ends with the masterpieces of Brueghel and Bosch. The trench warfare could perhaps have been avoided. To cite Churchill, referring to Count Ciano, Mussolini’s foreign minister, why talk to the monkey when the organ grinder is in the room? The answer is that in this case the monkeys are more important than the organ grinders. They are the infantry in which the ideas of their leaders and academic priests are realized. In their numbers, they are beyond the control even of those who work hardest to rile them up. To worry oneself too much with the theories of the professors would be analogous to having fought the Cold War by debating Soviet theoretician Mikhail Suslov in regard to the embarrassing intricacies of Marxist-Leninist thought. Apart from unavoidable forays, it is best to stay out of such thickets. As the manifestation of the theories shows, and as befits the state of the academy at present, the philosophical basis of the war on copyright is crackpot and stillborn. The actual battle is wherever the gnats in their millions crudely make real the musings of the Mad Hatters. We did not win the Cold War by debating Suslov but by making clear our principles, standing by them, and keeping an eye on the Red Army. That is, in a way, what I try to do in this chapter.

In the third chapter, “Notes on Virginia,” the battle moves to higher ground and chases the generals of the anti-copyright movement, taking into consideration some of the historical figures they embrace as their own: some accurately, others not. In claiming Macaulay they are quite

right—even as he and they are wrong. But they err when they claim Jefferson. I believe that were the third president somehow able to know of this unsolicited association, he would suffer a nausea so immense as to disturb him even in death. That this book was written in sight of Monticello makes honoring Jefferson by separating him from false claimants especially gratifying. The chapter also deals with some of the peculiar “microeconomic” arguments the opponents of copyright present, such as that copyright is a monopoly, a tax, and a gratuitous imposition upon a non-zero-sum game, all of which make it an inhibition to art.

A machine that can print books individually, on demand, quickly, and at little cost is actually at work now. “The Espresso Book Machine,” Chapter four, considers the evolution of the technology that has given rise to the movement against copyright, and how the forces and capabilities that ushered-in the battle can almost effortlessly usher it out and make it moot.

But that would not bring an end to the anti-copyright movement, because many of its foot soldiers, its generals, and Macaulay himself, their muse, are exercised less about copyright than about questions of political economy that bear upon their imagined rights and grievances. Not surprisingly, their arguments that are the most current and the least thoughtful rest upon the assumption that a disdain for the right of property confers a species of moral superiority. In the fifth chapter, “Property as a Coefficient of Liberty,” I argue that in its effects the right of property transcends the material and is in fact a pillar of ethics and morals. In this chapter, as in others, illustration is not subservient to theory.

Chapter six, “Convergence” (in visiting with my late Oxford tutor, and witnessing the mortally ill Flannery O’Connor besting in a single short story the many erudite volumes of Teilhard de Chardin) is an explanation and refutation of the deeper ideas that animate the electronic culture to its greatest vacancies, although for practical purposes all you really have to know about its philosophical basis is that its adherents be-

lieve somewhere deep down that there is such a thing as the free lunch.

The last chapter, “Parthian Shot,” is just that, a strike upon departing, a synthesis, reprise, and plea. Then, of course, there are notes, present for accountability in citation, which is as necessary to argument as honesty is to the law, but one needn’t dwell on these.

This book is about copyright and a great deal else, because copyright is far more consequential than may be apparent at first blush. But it is hardly the most important thing in life, and I hope my tone and perspective comport with that. Still, copyright is and has been a bulwark of civilization, and as such is a measure of its health, a version of the trite though true example of the canary taken into the coal mine. Arguments about copyright lead quickly to the larger arguments of culture, the habits and degeneration of the mind, property, individuality, rights and responsibilities, and the illusion embraced by modern man that he controls both the world and his fate. The clash over copyright is a perfect armature for a critique of digital barbarism, as it is a case study central not only to the subject but to the passions it engenders and the consequences as they are felt or yet to be felt. Should the foes of copyright prevail, civilization, though it will survive, will, even if they don’t know it, change radically and not for the better. And even if as is likely the bulk of them don’t know it, their movement—and it is a movement, replete with foundations, interest groups, and funding—is merely part of a much larger offensive of ancient pedigree. It is a perfectly representative and unsurprising manifestation of the collective versus the individual, of central direction versus local decision, of concentrated powers versus dispersed powers, of the large corporation versus the sole proprietor, of the combine versus the artist, of the industrialist versus the smallholder. They may think not, but you cannot claim to protect the little man while simultaneously liquidating the few rights by which he protects himself against the whiplash of the mass. They claim Jefferson because his passions made him a radical, but his passions made him a radical in defense of the yeoman, the small farmer, the individual.

I claim Jefferson because his passions and ultimately his reason were natural and humane—and he wrote like an angel.

Although there is hardly a shortage of anecdote in the pages below, there is a design. We survey the broad prospect ahead, and then enter a bloody and ongoing battle—mole against mole, tooth against tooth, all in darkness and mud—and then rise to float progressively higher and higher, in clear air over a brightly colored landscape, looking out over the forces arrayed in mutual opposition. There we calmly observe, assess, and comment, and then, at the end, descend once again to the fray. For although we may have risen, we are still obligated and responsible to the battle as it is now being fought, for this is our time, and we have no other.



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## CHAPTER 1

# THE ACCELERATION OF TRANQUILITY

### *Civilization and Velocity*

**History is in motion** as never before, and those moving with it are so caught up that they do not always see its broad outlines. Like soldiers in a rout, they seek objectives that will ruin them rather than the principles that may save them. Who are these soldiers? They are all of us. And what are the principles? If you search the past, hindsight makes them easy to see, but in the brightness of the present they are almost invisible. Still, it is possible to catch a fleeting glimpse of them, even if only as alterations in contrast.

In that spirit, consider the two paradigms that follow, not as you would two debaters, but rather two paintings hanging at opposite ends of a gallery. You are in the middle, bathed in natural light, forced by circumstance to judge their color and attraction.

### I.

AUGUST 2028, CALIFORNIA

You are a director of a small firm that supplies algorithms for the detection of damage in and the restoration of molecular memories in organic

computation. Previously, you specialized in repairing the cosmic ray degradation of atomic lattices in gallium arsenide nanorobotics, but the greater promise of organic replication and the lure of photon interlinking led you in a new direction.

You raised \$2 billion, most of which was devoted to the purchase of computers and laser armature looms for the growth and manipulation of organic compounds. Though your entire company is housed in a single 40,000-square-foot facility and has only ninety employees, it records assets of \$9 billion and annual revenues of \$32 billion.

All transactions are accomplished through data links—licensing, sales, billing, remittances, collections, investments. A customer can make a purchase, receive your product, and pay you as fast as he can speak orders to his computer. As the algorithms begin immediately to work for him, the money you've earned begins immediately to work for you, in, perhaps, Czech dormitory bonds that compound interest hourly. You go to your headquarters mainly for picnics, and otherwise work at home, as does your wife, who is a partner in a law firm in Chicago, where she has never been. In her study and in yours are floor-to-ceiling screens that produce three-dimensional images so vivid they appear real. Your best friend has grown rich writing the software that serves as your secretary. The preparation of documents is done by voice in another program, and the secretary concentrates instead on planning, accounting, arranging your schedule, and screening what used to be called calls but are now more or less apparitions.

You instruct the secretary to allow your wife's apparition to override all others. She is at a beach in Alaska (it is a bit warmer now), where you will shortly join her. Recently, you and she have quarreled. In virtual sex, in which you both wear corneal lenses that create a perfect illusion of whomever you might want, she discovered that you were entertaining not a commercial prostitional apparition but an old girlfriend. Hence her early departure for the Aleutians.

But this is August, the season of vacations, and you and she are

bound to make up. You will take a twenty-minute suborbital flight to Alaska, where you will spend several days at the beach in a primitive resort with no screens. Still, you have a backup of e-mail despite a recent tightening of your rejection protocols and a new investment in automated-reply software, the chief disadvantage of which is that, when in conversation with other automated-reply software, it tends to get overly enthusiastic. You were dismayed lately when you discovered that it and another ARS were building a golf course in Zimbabwe, but there is software for controlling it, and software for controlling the software that controls this, and so on and so forth.

Though seventy-five messages remain, you must catch your plane, so you instruct your screen to send them to your notebook. You'll take levels one and two coded personal apparitions as well, in the air and even on the winding track that leads to the resort. As you wait in San Francisco International Airport (having floated there in the Chuck Schumer Memorial Gas Blimp) you read in your notebook. There are no bookstores, and there are no books, but in the slim leather-bound portfolio is an uplink that gives you access to everything ever published or logged, and in any format, including the old Google formats prevalent before the government took control of all information during the celebrity crisis. You can call for a dual-language text of Marcus Aurelius, or the latest paper in Malay on particle acceleration. Your reading can be interrupted by the appearance of a friend in your portfolio, a look at the actual weather in Amchitka, a film clip of Lyndon Johnson's inaugural, or, for that matter, anything, summoned by voice, available instantaneously, and billed to your central account.

"Go to my files," you might say as you sit in the airport, "and get everything I've said in the last five years about Descartes. I made a remark with a metaphor about the law, co-ordinates, and virtual prisons. When you get it, put it on the screen in blue. Take a letter to Schultz, and file a copy at home and with the office."

But as you issue, you must also receive, and it never stops. Though



the screen of your portfolio is electronically textured to feel like paper and is as buff or white as flax or cotton, you miss the days of your father, when one could hold the paper in one's hands, and things were a little slower. But you can't go back, you can't fall behind, you can't pass up an opportunity, and if you don't respond quickly at all times, someone else will beat you to it, even if you have no idea what *it* is.

The world flows at increasingly faster and faster speeds. You must match them. When you were a child, it was not quite that way. But your father and grandfather did not have the power to make things transparent, to be instantaneously here or there without constraint. Unlike you, they were the prisoners of mundane tasks. They wrote with pens, they did addition, they waited endlessly for things that come to you instantly, they had far less than you do, and they bowed to necessity, as you do not. You love the pace, the giddy, continual acceleration. Though what is new may not be beautiful, it is marvelously compelling. Your life is lived with the kind of excitement that your forbears knew only in battle, and with an ease of which they could only dream.

## II.

### AUGUST 1908, LAKE COMO, ITALY

You are an English politician, a member of Parliament suffering patiently between cabinet posts, on holiday in Italy. In the two days it has taken to reach your destination you have fallen completely out of touch, although you did manage to pick up a day-old Paris newspaper in Turin. The *Times* will be arriving a week late, as will occasional letters from your colleagues and your business agent. Your answers to most of their queries will arrive in London only slightly before you yourself return at the end of the month.

The letters you receive are in ecru and blue envelopes, with crests, stamps reminiscent of the Italian miniaturists, and, sometimes, varicol-

ored wax seals over ribbon. Even before you read them, the sight of the penmanship gives away the identity of their authors, and may be the cause for comfort, dread, amusement, curiosity, or disgust. And as you read, following the idiosyncratic, expressive, and imprecise swells and dips like a sailor in a small boat on an agitated sea, the hand of your correspondent reinforces his thoughts, as do the caesuras rhythmically arrayed in conjunction with the need to dip the pen.

Some of your younger colleagues use fountain pens, and this you can detect in lines that do not thin, pause, and then fatten with a new load of ink. Occasionally, a typewritten letter will arrive. This you associate with the Telegraph Office, official documents, and things that lean in the direction of function far enough to exclude almost completely the presence of grace—grace not in the religious sense, but in the sense of that which is beautiful and balanced.

You will receive an average of one letter every two days, fifteen or sixteen in all, and will write slightly more than that. You are a very busy man for someone on holiday, and wish that you were not. Half the letters will be related to politics and governance, the other half to family and friendship. An important letter, written by the prime minister eight days before its reception, will elicit from you a one-page response composed over a period of an hour and three-quarters and copied twice before it assumes final form, for revision and so that you may have a record. You will mail it the next morning when you pass the post office during your walk. The prime minister will receive his answer, if he is in London, almost two weeks after his query. He will consider you prompt.

During your holiday you will climb hills, visit chapels, attend half a dozen formal dinners, and read several books, more than a thousand pages all told. If upon reading a classical history you come across a Greek phrase with an unfamiliar word you will have to wait until the library opens, walk there by the lakeside, and consult a Greek lexicon: one and one-half hours. Sitting in your small garden with its view of lake and

mountains, you will make notes as you read, and some of these will be incorporated in your letters. Most will languish until your return to London. By the time you look at them in a new season, only a few will seem worthy, and the rest you will gratefully discard.

In August you will hear music seventeen times. Five times it will have been produced by actual musicians, twelve times by a needle tracing the grooves in a cylinder and echoing songs in extremely melancholy imperfection through a flowerlike horn. You will attend the theater once, in Italian, but you will spend hours reading *Henry V* and *The Tempest* (which you read each summer), and several plays by George Bernard Shaw. In your mind's eye you will see the richest scenes and excitements known to man, and your dreams will echo what you've read, in colors like those of gemstones, but diamond-clear, and with accompaniment in sound as if from a symphony orchestra.

Your shoes are entirely of leather, your clothes cotton, silk, linen, and wool. You and your wife hired a rowboat and went to a distant outcropping of granite and pine. No one could be seen, so you stripped down to the cotton and swam in the cold fresh water. Her frock clung to her in a way that awoke in you extremely strong sexual desire (for someone your age), and though you made no mention of it on the bright rock ledge above the lake, later that night your memory of her rising from sparkling water into sparkling sunlight made you lively in a way that was much appreciated.

Indeed, your memory has been trained with lifelong diligence. You know tens of thousands of words in your own language, in Latin, Greek, French, and German. You are haunted by declensions, conjugations, rules, exceptions, and passages that linger many years after the fact. Calculations, too, built your character in that you were forced to work elaborate equations in painstaking and edifying sequences. As in other things, in mathematics you were made to study not only concept but craft. And, yes, in your letter to the prime minister, you repeated—with honorable alteration—a remark you made some time ago regard-

ing Descartes. At first you could not remember it, but then you did, because you had to.

Necessity you find to be your greatest ally, an anchor of stability, a pier off of which, sometimes, you may dive. Discipline and memory are strengths that in their exercise open up worlds. The lack of certain things when you want them makes your desire keener, and you are better rewarded when eventually you get them.

You cannot imagine a life without deprivations, and without the compensatory power of the imagination, moving like a linnets with apparent industry and certain grace, to strengthen the spirit in the face of want. Your son went out to India, and you have neither seen him nor heard his voice for two years. Thus, you have learned once more the perfection of letters, and when you see him again, worlds will have turned, and for the best. It was like that when you were courting your wife. Sometimes you did not see her for weeks or months. It sharpened your desire and deepened your love.

You have learned to enjoy the attribute of patience itself, for it slows time, embraces tranquility, and lets you savor a world in which you are clearly aware that your passage is but a brief candle.



**I am of course** deeply predisposed in favor of the second example, and in my view the vast difference between the two is attributable not to some inexplicable superiority of morals, custom, or culture, but rather to facts and physics, two things that, in judging our happiness, we tend to ignore in favor of an evaporative tangle of abstractions.

Unlike machines, we are confined to an exceedingly narrow range of operations. Though we may marvel at the apparent physical diversity of the human race, it is, given its billions of representatives, astonishingly homogenous. Of these billions, only a handful rise above seven feet. Not

a one is or has been over ten feet. And the exceedingly low standard deviation in form is immense compared to that which applies to function. There is no escape from the fact that after a set exposure to radiation; absent a given number of minutes of oxygen; at, above, or below certain temperatures; or subject to a specific G-force, shear, or shock, we will expire. No one will ever run the mile in two minutes, crawl through a Cheerio,<sup>™</sup> or memorize the *Encyclopaedia Britannica*.

Because of our physical constraints we require a harmony of the elements that relate to us and of which we are often unaware. The Parthenon is a pleasing building, and Mozart's Fifth Piano Concerto a pleasing work, because each makes use of proportions, relations, and variations that go beyond subjective preference, education, and culture into the realm of universal appeal conditioned by universal human requirements and constraints.

A life lived with these understood, even if vaguely, will have the grace that a life lived unaware of them will lack. When expanding one's powers, as we are in the midst of now doing by many orders of magnitude in the mastery and flow of information, we must always be aware of our natural limitations, mortal requirements, and human preferences. For example, unlike his modern counterpart, the Englishman at Lake Como is graciously limited in time and space. Because the prime minister is in London or at Biarritz, the prime minister cannot sit down with him and discuss. In fact, during his fictional stay, only one of his colleagues visited, and spent several hours on the terrace with him in the bright but cool sunshine. All others were kept away by time and distance.

The man of 2028, on the other hand, is no longer separated from anyone. Any of his acquaintances may step into his study at will—possibly twenty, thirty, forty, or fifty a day. If not constantly interrupted, he is at least continually subject to interruption, and thus the threshold of what is urgent drops commensurately. No matter how urgent or pressing a matter, the prime minister *cannot* sit down with the tranquil politician. No matter how petty a matter, a co-worker *can* appear to the man of 2028. Screening devices or not, the modern paradigm is one

of time filled to the brim, of life choked and breathless. Potential has always been the overlord of will, and the man of the first paradigm finds himself distracted and drawn in different directions a hundred times a day, whereas the British statesman is prodded from without only once or twice. And when he wants light at his Italian lake villa he does not throw a switch or speak a command, he lights a candle, and enters into a relation with it—protecting it from a breeze or being overturned, staying within its dim light, alerted by its flickering of changes or movements, aware of its scent, warmed by its flame, conscious of its burning down.

Were we gods, we might be able to live well without rest and contemplation, but we are not and we cannot. Whereas our physical capacities are limited, those of the machine are virtually unlimited by comparison. As the capabilities of the machine are extended, we can use it—we imagine—to supplement our own in ways that will not strain our humanity. Had we no appetite or sin, this might be true, but our desires tend to lead us to excess, and as the digital revolution has quickly progressed we have not had time to develop the protocols, manners, discipline, and ethics adequate for protecting us from our newly augmented powers. In fact, as is the subject of the first half of this book, we often rush mercilessly and barbarically to abolish them.

The history of the last hundred years has been, as much as anything else, the process of encoding information: at first analog, in photographic emulsions, physical and magnetic patterns in needle grooves or on tapes, waves in packets blurted into the atmosphere, or in the action of x-rays recording paths of varying difficulty through tissues of various densities on plates of constant sensitivity. With binary coding, electrons as messengers, and the hard-fought mathematical adaptation necessary for control, we can now do almost everything in regard to information. We may, for example, look through billions of pages in an instant, or process and match data fast enough so that a cruise missile can make a “mental” picture of the terrain it overflies almost as impressive as that of an eagle.

And because potential has always been the overlord of will, and as the new machines hunger for denser floods of data, images have gradually displaced words. The capacious, swelling streams of information have brought little change in quality and vast overflows of quantity. In this they are comparable to the ornamental explosions of the baroque, when a corresponding richness of resource found its outlet mainly in overdecorating the leaner body of a previous age.

All the king's horses and all the king's men of multimedia cannot improve upon a single line of Yeats. One does not need transistors, clean alternating current, spring-loaded keys, and ten-million-hour "programs" for writing a note or a love letter—and yet this is how we now write notes and love letters, going even to the extreme of doing so on complicated electronic pads that though they tediously strain to imitate a sheet of paper fail for want of simplicity.

I am not decrying the digital revolution per se, or recommending for you and your children the cold water, wood fires, and Latin declensions of my brick-and-iron childhood. I have always understood that the heart of Western civilization is not the abdication of powers but rather meeting the challenge of their use. And, of course, it would take a person of less than doltish imagination not to be attracted by the wonders and aware of the benefits of all this new stuff.

The British statesman of the second paradigm might well have lost a son or daughter to a disease that could have been detected early and with precision by the digital diagnostic techniques of modern medicine. The *Titanic*, four years in the future, might not have gone down—with him aboard, perhaps—had real-time thermal maps of the North Atlantic been available to its captain. And so on. You know the litany, because you are bombarded by it daily.

The impossibility of abdication is also due to the necessity of racing the genie after it has exited the bottle. Although antediluvian nuclear protestors have not, apparently, even a clue, they are on the wrong track. Nuclear weapons are now small enough, reliable enough, simulable

enough, and widespread enough to be a rather mundane constant in calculations of the military balance (at least in regard to the major powers). The guaranteed action and volatility is in command, control, communications, intelligence, and guidance. Digitally dependent advances will enable submunitions scattered in great number over a future battlefield to hide, wait, seek, fight, and maneuver. For example, rather than a platoon of tank-killing infantry, a flight of submunitions will not long from now be able to land with little detection far behind enemy lines, where it will hide in the treetops or the brush and await patiently for as long as required the approach of an appropriate enemy target, such as a tank, which it will then dutifully pursue, engage, and destroy, its reflexes as fast as light.

No matter what arms agreements come into being, with the passage of each day a first nuclear strike becomes more and more feasible. The possibility of real-time terminal guidance as a gift from satellites to maneuverable reentry vehicles makes any kind of mobile deterrent just a temporary expedient. Even submarines, nuclear stability's ace-in-the-hole, will no longer be secure bastions for nuclear weapons, as thermal and radar imaging from satellites pick up surface perturbations upwelling from their undersea tracks, and as the panoply of antisubmarine warfare is resurrected (as it will be with the rise of China's submarine fleet), refined, empowered, sensitized, and its weaponry mounted on ballistic missiles that will be able to reach any area of ocean within minutes.

It is also possible that in some war of the not-so-distant future a combatant will electronically seize control of enemy command structures and direct his opponent's arsenal onto his opponent. Eventually, all battles will be entirely computational. The "arms competition" of this sort has already begun. To step out of it at this point would be to lose it, and, with it, everything else.



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