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Whole-Body Apoptosis

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ABSTRACT

In order to minimize the prolonged debility of old age, we should be designed to die abruptly and painlessly at some randomly determined time between 85 and 90 years old. This might help us trade the goal of living for as long as possible with the goal of living as well as possible.

Keywords: apoptosis, choice, death, euthanasia, longevity

> Life is full of misery, loneliness and suffering – and it's all over much too soon (Woody Allen).

Anybody who has lived through the ordeal of watching an elderly parent die by inches knows that this is no way to end one's life. Given that death is (still) inevitable, which would you prefer for your last months on earth: being struck by lightning at some point *before* you began losing your faculties, or an indefinitely long period of decline, during which you would gradually become unable to perform the simple actions of life and participate meaningfully in conversation or decision-making? Almost everyone I have talked to strongly prefers the sudden-death option, but lightning almost never strikes, and many thinking people have a reasonable distaste for any contrived departure – suicide or assisted euthanasia – that necessarily involves decision-making by themselves or others. Why? Because wherever there are such decisions to be made, about quality of life, or degree of impairment or suffering, there are inevitable opportunities for undesirable motives to creep into the mix: greed or impatience or – on the side of the soon-to-die – guilt about staying alive beyond one's allotted span. Any practice that became widespread and socially acceptable would, one fears, carry with it an irresistible pressure towards too much self-consciousness of the wrong sort. As the philosopher Kurt Baier once quipped, echoing Socrates, "The unexamined life is not worth living, but the over-examined life is nothing to write home about either". We don't want to end our days wondering if everyone around us is glancing at their watches and sizing up our remaining faculties against some unstated but all too present threshold. The recognition that one has "lost a step" on the various playing fields of life is bad enough without having to consider how it affects the bottom line on the great spreadsheet of one's life.

So it would be better, would it not, for the power of decision and the concomitant obligation of making a reasonable judgment to be taken out of the hands of everyone else – family, friends, "society" – and oneself. How could this be accomplished? How could we engineer lightning strikes without specific human intervention and without chaos? By designing and installing in everyone a robust system of *whole-body apoptosis*. Apoptosis is programmed cell-death. As Wikipedia notes:

> Apoptosis is a process of deliberate life relinquishment by a cell in a multicellular organism. It is one of the main types of programmed cell death (PCD), and involves an orchestrated series of biochemical events leading to a characteristic cell morphology and death. The apoptotic process is executed in such a way as to safely dispose of cell corpses and fragments.

In contrast to necrosis, which is a form of traumatic cell death that results from acute cellular injury, apoptosis is carried out in an orderly process that generally confers advantages during an organism's life cycle. For example, the differentiation of fingers and toes in a developing human embryo requires cells between the fingers to initiate apoptosis so that the digits can separate. Between 50 billion and 70 billion cells die each day due to apoptosis in the average human adult. For an average child between the ages of eight and 14, approximately 20 billion to 30 billion cells die a day. In a year, this amounts to the proliferation and subsequent destruction of a mass of cells equal to an individual's body weight.

We could arrange to have a human body switch itself off quite abruptly and painlessly at a time to be determined. Almost nobody would want to know to a near certainty the exact day and hour of their death, and the reasons why are made vivid in any number of death-row dramas. So a humane system should introduce a substantial element of randomness, elongating the bell-shaped curve of programmed death-knells over a period of, say, five years. Then you would know to a moral certainty that if you hadn't already died of some other cause, then at some unpredictable time between, say, your eighty-fifth and ninetieth birthday, you would quite suddenly drop in your tracks, perhaps in the middle of a golf swing, or while trying to finish writing your latest novel, or even while making love.

The implications and repercussions of such an attempt to engineer programmed body-death into ourselves and our descendants are mind-boggling. We can begin to get some grip on the pros and cons by sketching out the specs for a simple version that may need substantial tweaking:

> *Whole-body apoptosis 1.0.* We install in every human being and in every subsequent human embryo a system that ensures the swift, painless death at some *randomly determined time* between the age of 85 and 90, if death from some other cause has not already occurred.

How could we accomplish this? The technical details *are* important, since each conceivable means to this end has some drawbacks or weaknesses associated with it, and we can expect these to be magnified by all manner of human disagreement. It is quite possibly true – let's think about it – that the ethical and political problems that would beset any such system would make it essentially unimplementable: you can't get there from here without committing some ethically unacceptable or politically infeasible act. In that case, we'll be stuck with our current dismal ways of dying, but let's explore the territory to see what might be possible.

The technical project divides quite naturally in two: providing a system for the already alive, and genetically engineering a system for subsequent embryos.

The latter is a problem for "evo-devo" (evolutionary-developmental) biologists, who are beginning to understand the cascades of biological clocks that turn on and off various developmental processes. We know quite a lot about how our biochemistry arranges the timing of such events as puberty and menopause, and we even know that human culture has already "interfered" successfully with such a process in the distant past. Unlike all other mammals, many of us human adults can digest raw milk, because natural selection has produced a gene that turns off the machinery that would otherwise turn off the production of lactase at weaning. So common is this genetic revision in our species that we refer to those who lack it as "lactose intolerant" instead of referring to the rest of us as, say, "digestively infantile"! It was the human practice of dairying, culturally evolved and transmitted, that provided the selection pressure for this genetically transmitted adaptation.

What natural selection can accomplish over a few thousand years (agriculture began roughly 10 thousand years ago) ought to be within the grasp of genuinely intelligent designers over a few decades. I see no reason why we could not now genetically engineer an enzymatic time-bomb that would reliably explode at some time late in life. Perhaps it would suddenly start spewing *endocurarins* into the bloodstream, stopping all voluntary muscle movement and hence suffocating the body more effectively than any pillow. (We are making up the term "endocurarin", inspired by the naming of *endorphins*, endogenously created opioids that produce such phenomena as the runner's high. Curare, the legendary blow-pipe dart poison that swiftly paralyzes the muscles leading to asphyxiation, led to the development of muscle relaxants for surgery – D-tubocurarine, for instance – that would kill the patient were it not for the respirator that accompanies its administration.) Might some genes be designed to generate endogenous curare? Could we perhaps import the relevant genes from poisonous plants or frogs and adapt them to serve this purpose in our bodies? (We can already make a tobacco plant that glows in the dark because it has firefly genes spliced into its genome.)

Or perhaps we could engineer a gene that, when triggered by a biological clock, would produce some kind of endogenous nerve gas, or something that would lead to a catastrophic collapse of blood vessels, causing a massive stroke and brain death. I leave further exploration of these and other alternative physiological death-delivery systems to the experts, noting only a few of the obvious desiderata: the method employed should be highly reliable, inscrutable (there is no practical way of assaying the system to figure out *exactly* when you will die), utterly non-toxic earlier in life, as tamper-proof as possible, and with no seriously debilitating *genetic* side-effects. (We will explore the myriad *non-genetic* side effects of such a system in due course.)

What, then, about those already living? What, for instance, would I choose to have administered to me, now, in order to achieve this effect at some point roughly 20 years down the road (I am 65 as I writes this). The simplest system, perhaps, would be a time-release poison capsule of the sort now well known to medicine, but with a 20-year (+ random < 1800 days) fuse. This could be implanted like a pacemaker, and surrounded by tamper-proofing (if you try to remove it surgically, it blows up prematurely). Better might be the injection of a bio-engineered drug that would begin accumulating something in the bloodstream that would suddenly (after 20 years plus) go haywire. Needless to say, the reliability and non-toxicity of any such introduction would have to be very, very high before I would volunteer for it, but I imagine it would be only moderately more momentous a life decision than a vasectomy, or undergoing some optional surgery with a low probability of a fatal outcome. We are becoming used to making such decisions, and for good reason. They reliably solve important life problems with acceptable levels of risk.

But how many others would share my attitude? What public service campaigns, educational programs, political debates and discussions could conceivably engender a majority, let alone a consensus, to adopt such a system? (I am are going to set aside, for now, the interesting and important economic issues concerning health insurance and life insurance, and the impact such a system would have on them, since I want to stress that this is not a proposal designed primarily to save the taxpayers money or preserve the inheritances of the living, but a proposal designed to reduce the large and inevitably growing amount of pointless suffering that our other technologies have in store for us if we don't change something.) Given what we know about the controversies surrounding fluoridated water and compulsory vaccination programs, we can expect a firestorm of debate about any such proposals. But those campaigns also teach us a great deal about how to present such issues – and how not to do it. The "tampering with God's will" objection is getting ever more threadbare and unconvincing with overuse, and people are beginning to appreciate the benefits of intervention, and adjust their principles and creeds to accommodate it.

"Aha!" say the diehards (as we may come to call them). "We now see that we were right to dig in our heels about all these earlier technological enhancements! They paved the way for this horror of horrors: programmed death!" But technology that they have already come to accept continues to make *un*programmed death ever harder to contemplate and endorse – think of poor Terri Shiavo – so I think the diehards will attract less and less supporters.

What, aside from tradition masquerading as "principle," stands against such an innovation? Who would be harmed by it? People who otherwise would have lived healthy lives till they were a hundred? This raises a sensitive issue about which people may disagree: is 85 too young or too old? Only a few decades ago, spry 90-year-olds were quite rare, but not today. Should the programmed *kill-by date* be moved up to 95 or even 100? That would give quite a few healthy oldsters a few more years of life worth living, but also would fail to kick in soon enough to forestall a lot of suffering. How do we balance the increase of suffering against the non-suffering lives of a few? Clearly, there is no point in adopting such a system unless it actually does cut down most people "in their prime"! If you would prefer to die by lightning bolt while you are still effective and healthy, the price you must be willing to pay is foregoing some years or months that would have been just as effective and healthy as your last days. We haven't had any experience thinking of our lives in terms of *diminishing returns*, and many will no doubt still feel that *more days of life*, no matter how painful and confused, is always better than less. But perhaps we can begin to contemplate, and take seriously, the idea that just because we *could* arrange to live to be 100 (or 120!) we really have no right to use up so much more than our fair share of the world's resources and amenities.

This is a new and unsettling way of thinking of your life, and it is hard to say how people would adjust their expectations to the recognition of the realities of the system. Would people plan to go out in a blaze of glory? Would those who could afford it set aside just enough to tide them over (in health) for a few years, and then give away the rest, so that they would get to enjoy the delight and gratitude of their heirs? Would people start a tradition of having 85th-birthday-party extravaganzas that celebrated the life and deeds of people in much the way funerals do today, but with the not-yet-departed one present? And what would the lame-duck period after 85 be like? One would still have all one's rights, and could go right on working or playing as one chose, perhaps living a bit more riskily, perhaps not. It should be remembered that we already know that we're all going to die, and quite soon, if we're in our eighties. This innovation would sharpen an existing anticipation, not create something entirely new.

One of the most interesting objections I have provoked in recent discussions is the suggestion that this policy, if adopted, would rob us of precious opportunities to prove our strength by enduring suffering. One friend told me that she never appreciated her mother at all until she nursed her through an agonizing death and saw her indomitable will and dignity under horrible conditions. If this policy had been in force, her mother would h ave died unappreciated. But that suffering is a huge social cost to pay for such occasional redemptions, I would say. Besides, the same line of thought could be used to disallow the pain-killers now routinely given in whatever doses are needed to do the trick, on the grounds that we were depriving these poor souls of golden opportunities to prove their fortitude to skeptical family members and other onlookers. Yes, there would be less employment for end-of-life caregivers who now find their life's meaning in taking care of semi-comatose, incontinent, incommunicative old folks. Some might be dismayed by the waning of this tradition, but not many, I surmise. And there would still be plenty of suffering to witness and relieve, since nothing in this proposal would guarantee that people wouldn't die terribly prolonged deaths at age 60 or 70 or 80 of all manner of diseases and conditions.

Another objection has often arisen, put very well by a referee for this journal:

> Dennett observes that "spry 90-year-olds" are less rare today than several decades ago, but goes on to offer a diminishing returns argument that says that (a) dying in one's prime is a price worth paying to avoid a lingering, painful and confused end, and (b) that living to 120 or so would involve using up more than our fair share of the world's resources and amenities. However (a) & (b) are somewhat separable: if the person is increasingly impaired then extending life to 120 (for example) would involve declining quality of life and (perhaps) wasteful consumption of resources. On the other hand if the person remains healthy and active then they have gained 30 years of good quality life compared with the fate of previous generations. Arguing that a healthy 30 years should be abbreviated to save resources looks like a complex job from a moral standpoint, and in any event if the person is healthy then they might well be productive, generating a net social gain for the extra years, just as major extensions to lifespan have had adaptive benefits in past human evolution. To be reasonable it looks like the programmed lifespan must fairly closely match the healthy lifespan. Implementing such a system, however, requires estimating 80 (or perhaps even 120) years into the future, in the face of the possibility that in the meantime new developments might prolong healthy life further. Workarounds that address the problem might be possible (perhaps capacity to reset approximate time of death?), but this adds significant extra complexity.

Yes, indeed, we could use technology to fine-tune the system, to monitor various plausible measures of quality of life in both individuals and populations, so that apoptosis could more optimally track actual mean rates of decline – or even rates of decline in individuals – so that apoptosis could be customized in any of a dozen ways. A mathematical model of expected healthcare savings under variable regimes of apoptosis has already been sketched. But while these might be possible, and might be desirable improvements, they cut against the spirit of my proposal, which is to use technology to *remove* this issue from our decision-making options and the incessant monitoring that would rationally follow in its wake. To give a heightened sense of the flavour of my proposal, consider how you would feel about adopting elaborate falling-in-love-monitoring technology, which could take the guesswork out of romance (and prove its value by a diminished divorce rate, yadda yadda yadda). We should pause to take seriously – very seriously – the prospect of protecting some aspects of our lives and deaths from *management*, and thereby reframing our landscape of decisions. Why *should* we devote so much of our R&D budget to finding ways of extending life? We aren't similarly obsessed with ways of making our descendants taller or stronger or smarter. Knowing that you could expect only so many years of life might focus your mind, and will, wonderfully.

The idea of whole-body apoptosis opens up vertiginous vistas on the meaning of life and suffering, the unexamined assumption that *more* is always better than *less*, and the prospect of being able to live out your remaining days relatively confident that your survivors will not have to set aside memories of a pathetic decline in order to get to the memories of you that matter. What would you trade for that? I'd trade any number of years over 85.

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