

Why it is our duty to strive to develop medicine that eliminates aging

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Chief Science Officer

What is aging?

Metabolism

ongoingly causes “*damage*”.

Damage

eventually causes pathology.

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So who dies of aging?

Death from aging is not only “natural causes”

It's anything that mainly kills older people

About **150,000** people die per day worldwide

Two thirds of them die of aging: **100,000/day**

In the industrialised world, it's over 90%

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And it's very expensive

Most of a typical person's medical expenses are incurred in the last year of their life

Time caring for parents etc

Lack of wealth-contribution

And besides: distinct expertise!

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Aging is not like measles

Gerontology

Geriatrics

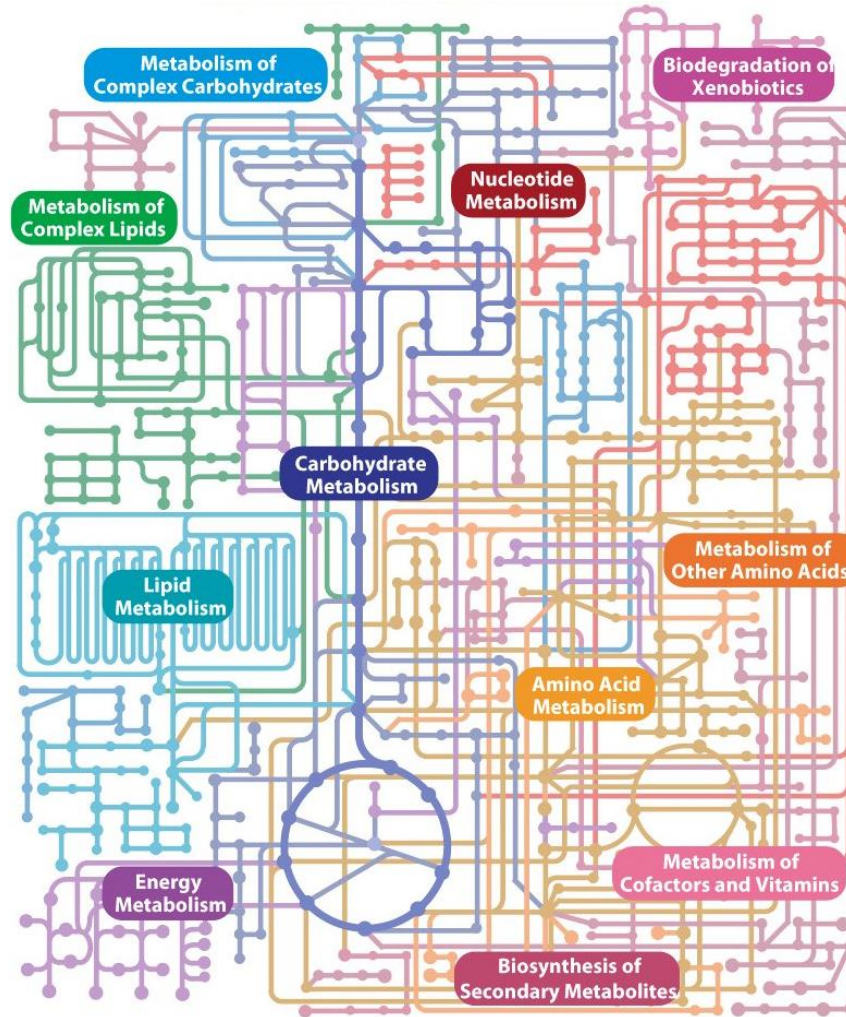
Metabolism → Damage → Pathology

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Unfortunately, this is metabolism



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Maintained to last



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What is regen med?

Any intervention that seeks to **restore the structure** of a tissue/organ to its state before it suffered **damage**

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SENS Research Foundation

SENS Research Foundation is a US-registered charity that works to develop, promote and enable widespread access to **regenerative medicine** solutions to the disabilities and diseases of...

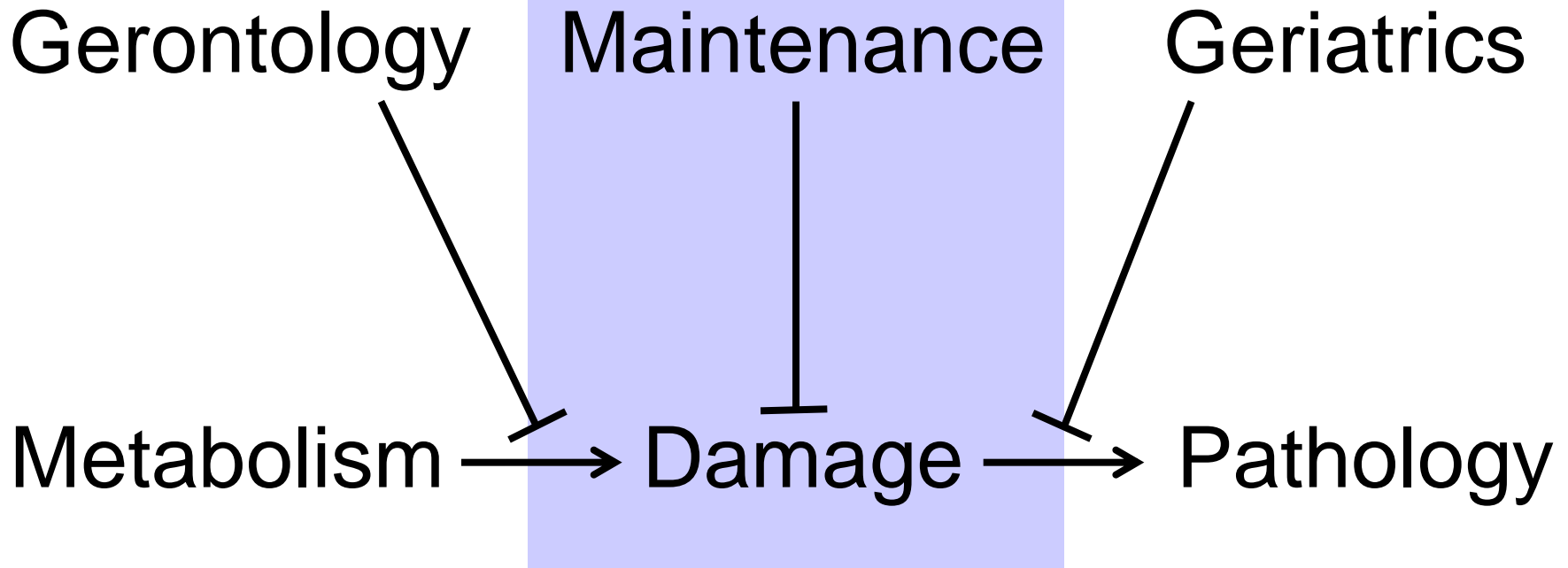
AGING

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There is an option 3

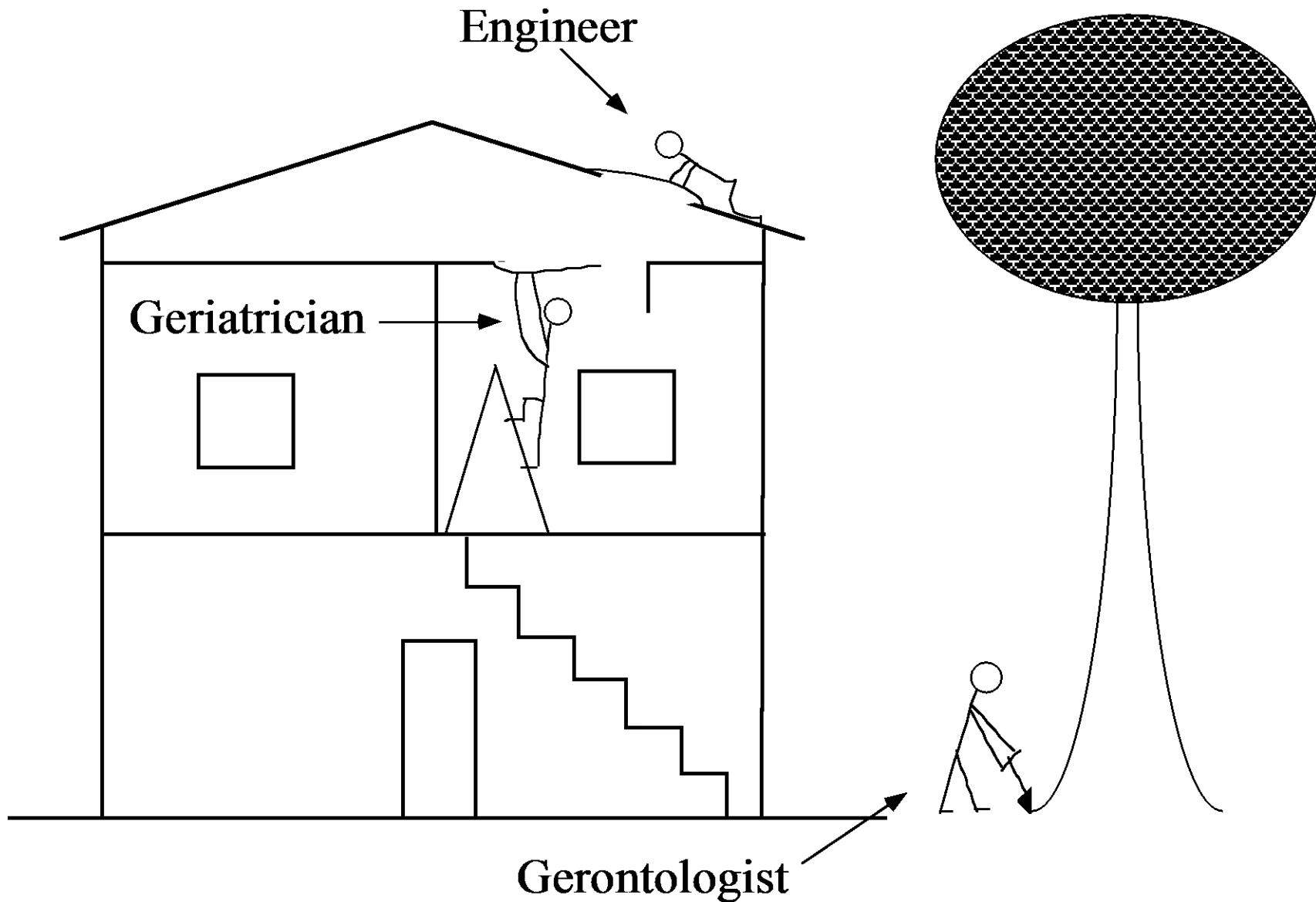


Claim: unlike the others, the maintenance approach may achieve a big extension of human healthy lifespan quite soon.

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This is the damage

Seven Deadly Things

Cell loss, cell atrophy

Division-obsessed cells (cancer)

Death-resistant cells

Mitochondrial mutations

Intracellular junk

Extracellular junk

Extracellular crosslinks

No new type of damage confirmed since 1982!

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We know in detail how to do it

Giving the middle-aged 30 years of extra healthy life:

Robust Human Rejuvenation

Damage rising with age	It or its effects reversible by
Cell loss, cell atrophy	Cell therapy, mainly
Division-obsessed cells (i.e. cancer)	Telomerase/ALT gene deletion plus periodic stem cell reseedling
Death-resistant cells	Suicide genes, immune stimulation
Mitochondrial mutations	Allotopic expression of 13 proteins
Intracellular junk	Transgenic microbial hydrolases
Extracellular junk	Phagocytosis by immune stimulation
Extracellular crosslinks	AGE-breaking molecules/enzymes

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Learn more

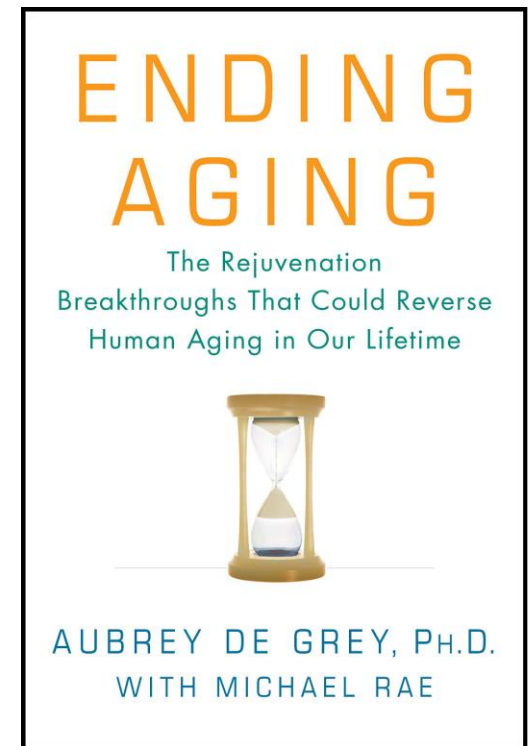
Read the (semi-technical) book.

Available at Amazon and all good book stores.

Paperback is cheaper, and has an extra chapter!

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Q: Why then is aging defended?

A: Rational denial

- Aging is ghastly
- Aging is inevitable

It *is* rational to put ghastly but inevitable things out of our minds, even if we have to be amazingly irrational in order to do so.

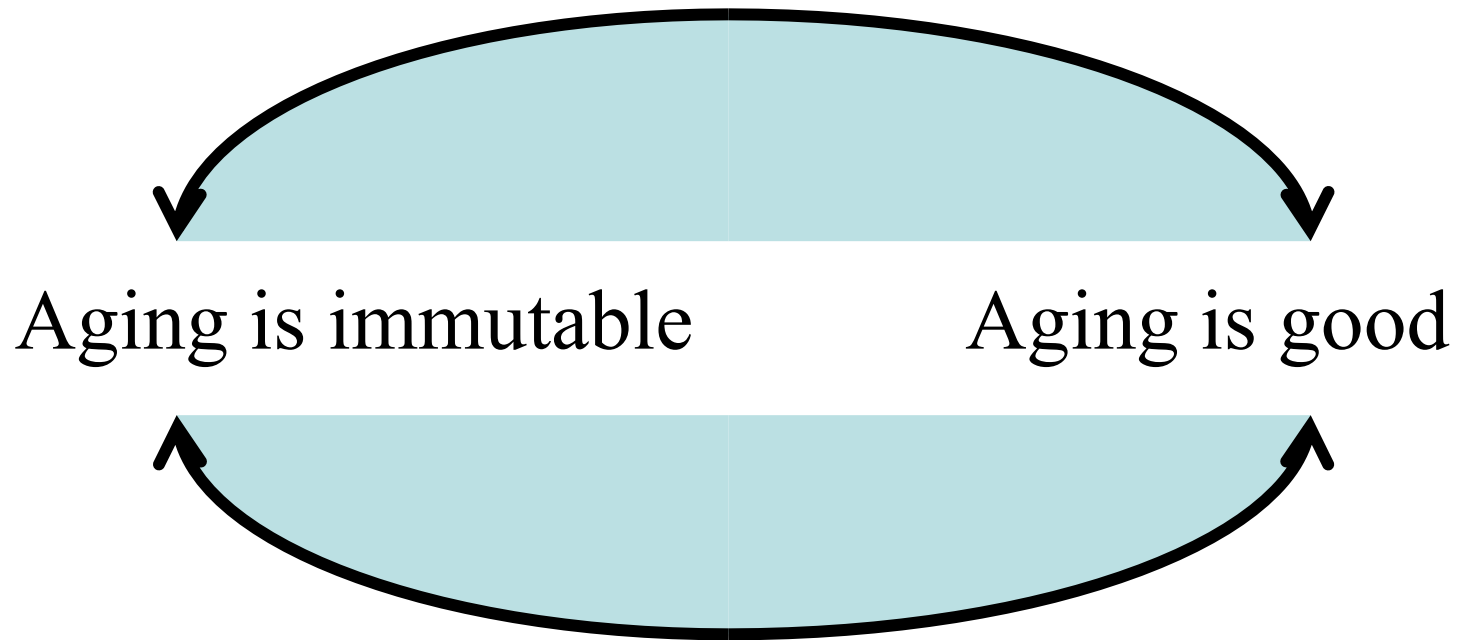
But that inevitability has become unclear...

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The pro-aging trance



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Potential ethical issues of seeking to defeat aging

- It's wrong to seek "immortality" via technology
- We might end up with extended ill-health
- It might undermine the dignity of the elderly
- It might be at the expense of other good work
- The speed/chance of success might be poor
- Other unknown things might go wrong

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Death-resistant cells	Suicide genes, immune stimulation
Mitochondrial mutations	Allotopic expression of 13 proteins
Intracellular junk	Transgenic microbial hydrolases
Nuclear [epi]mutations (only cancer matters)	Telomerase/ALT gene deletion plus periodic stem cell reseedling

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Longevity escape velocity (LEV)

The rate at which rejuvenation therapies must improve (following the achievement of RHR) in order to outpace the accumulation of so-far-irreparable damage.

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Defeating aging: back to the future?

Until 200 years ago, death from aging was rare; age at death had a radioactivity-like distribution

Today, nearly everyone in the industrialised world dies between 60 and 100

Without aging, we'd thus *return* to the pre-medical era in terms of the distribution of ages at death, just stretched out

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What defeating aging means in the long term

We don't know how old the first 150-year-old is today...

But the first 1000-year-old is very probably <20 years younger

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What defeating aging means in the short term

Nobody gets Alzheimer's
Nobody gets heart attacks
Nobody gets cancer

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It's not about longevity

Any longevity benefit is a side-benefit

*This is about your **health!!!!***

Looking, feeling, functioning as well as in your early adulthood, however long ago you were born

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What some social scientists say

Several professional groups present themselves as 'waging war' on old age. Examination of the language and symbolic practices of these groups reveals that they share a dominant cultural view that devalues old age and older people. [Some of these] groups disguise a contradiction in their aim of understanding the diseases and disorders of old age by advocating the goal of an extended 'healthy life span', which avoids having to confront the moral dilemmas of extending the lifespan for its own sake. John Vincent

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Discount rate for suffering?

Does an *expected* reduction by X of the suffering of Y people count less if it happens 20 years from now than if it happens tomorrow?

- Positive feedback: earlier impact may spur more effort to do more thereafter
- Uncertainty: intervening events may make the effort pay off less than expected

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The case of GiveWell

“I think that life extension would be desirable. The question that I **believe it will take us a while to resolve** is whether it represents the best use of medical research funding when factoring in existing efforts and **tractability relative to alternatives.**”

Holden Karnofsky, email 11/12/2012

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High risk, high gain?

“My house probably won't burn down this year - but I still buy house insurance. I probably won't be hit by a car as I hit the road - but I should still check for cars. When the stakes are high enough, we definitely need to take into account low-probability events.”

Ben Hoskin, GWWC blog, 17/1/2013

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High risk, high gain?

"De Grey might be mistaken, but if there is only a small chance that he is right, the huge pay-offs make anti-aging research a better bet than areas of medical research that are currently far better funded."

Peter Singer, Project Syndicate, 10/12/2012

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High risk high gain, high variance?

- If we knew chances of success exactly, things would be easy
- The temptation is thus strong to focus on areas where we ~do
- Should we resist that temptation?

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What sci-fi writers say

Imagine a near future where a cure for aging is discovered and - after much political and moral debate - made available to people worldwide. Immortality, however, comes with its own unique problems, including evil green people, government euthanasia programs, a disturbing new religious cult, and other horrors. Witty, eerie, and full of humanity, *The Postmortal* is an unforgettable thriller that envisions a pre-apocalyptic world so real that it is completely terrifying.

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What many top biologists say

“There are two main reasons why you should reject the idea of defeating ageing completely. First, the mission is utterly unrealistic and is a **distraction from the hard and costly task of preventing and curing disease**, whatever the age at which the disease happens. Secondly, if this miracle should somehow happen, the consequences would be a disaster for humanity and for the planet.”

Colin Blakemore

Former head of the Medical Research Council

(Translation: far more influential than any biogerontologist on the planet)

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Things we don't know about future population

How many kids people will want

At what age they'll want to have them

How Earth's carrying capacity will rise

Whether automation will end all work

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“Why bother, if heaven awaits us?”

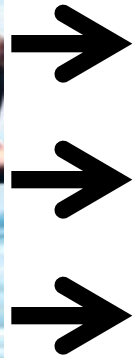
- 1) Are we being tempted to hasten our death by not combating aging?
- 2) By tolerating our own aging and death, aren't we rejecting the chance to do more good in this world?
- 3) Above all, doesn't defending aging mean rejecting a chance to alleviate suffering?

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A reminder...



It's up to **you** to help us stop this!

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