tetrapod hindlimb evolved in those fossil taxa after having been reduced to a vestige in more basal lineages and their common ancestors. With regard to the purported absence of "experimental and phylogenetic support," we regard recent studies of python limb vestiges and hox genes (*4*) as evidence for morphogenetic regulatory mechanisms that might be conserved in the absence of actual expression of complex features (*5*). And elegantly detailed studies have demonstrated, for example, that mosaic patterns of gains and losses must have occurred in the evolution of pelvic and distal limb elements among various elongate lizards and basal snakes [for example, (*6, 7*)]. Reoccurrences of complex structures might well be improbable, but in the light of comparative and developmental biology, they are not "implausible."

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Immortality, Anyone?

I hope for John Harris's sake (as well as my own) that his predictions of therapeutic immortality (Essay, "Intimations of immortality," *Science*'s Compass, 7 Apr., p. 59) will come true soon. But I fear that his planned ethical controls will not run smoothly. In the not-too-distant future, one of his counseling sessions at "Telomeres R Us" might run something like this:

John Harris: Congratulations, sir! I hear your treatment was successful and that you are now a wealthy immortal.

WI: Thank you.

JH: Before you leave, I would like you to read over this contract and sign it. We call it Option A.

WI [after reading the contract]: Hey! Wait a minute! This says that I consent to "Generational Cleansing" after living "a reasonable number of years, said reasonable number to be determined by the Institute of Medicine, Law, and Bioethics at the University of Manchester."

JH: Isn't that acceptable?

WI [scarlet with rage]: Are you out of your mind? After what I paid for this treatment? This is the biggest load of...

JH: OK! OK! You don't have to sign it. I told you, that's just Option A. Why don't you read this one instead? We call it Option B.

WI [reading out loud]: "I hereby agree to waive all my rights to reproduce; should I do so, I will have all subsequent immortality therapies terminated..."

JH: Yes. Would you prefer to sign that one instead?

WI: Let me ask you a question, doc. What if I tell you to take both of these agreements and stick them in your ear. What would happen to me?

JH: Well, that's difficult to answer at the moment. Potentially, you could face some very serious legal penalties.

WI: Is that so? Well, let me tell you, I'm a very wealthy man, and I can afford the best lawyers. So can my buddies who've also had this treatment. Between us, we can paralyze any planned legislation that might limit our life-spans or our reproductive rights or anything else you can think of. Do you think we're going to sit still and let sanctimonious zealots like you interfere with our hard-won immortality?

JH: That's a very selfish attitude! What about all the people who aren't as rich as you and can't afford the treatment? What about all the people who can't get jobs because immortals like you never retire? What are you going to tell them?

WI: Same as I'm telling you, doc. Get a life!

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The search for immortality has been a long-term endeavor that humankind has pursued since the beginning of time. Philosophers, adventurers, and modern-day scientists have given their best efforts and mental energies to find "the key" or elixir that would allow many (or all) of us to share the "benefits" of this plateau of human existence. To achieve immortality seems to be a goal worthy of a society that sees itself at the pinnacle of development in comparison with its past history.

I believe that this "search for extended life-spans" (immortality) is not necessary at the moment or the foreseeable future. Why so, you might ask? Because the notion of mortality that every one of us carries through life is the engine that propels us to do our best to grow as better individuals. The certainty that life is short and time can't be wasted is and always will be the incentive for all the seekers of truth.

If humankind ever, by its own means, achieves this so-called "immortality," I'm sure that individuals will find that experience boring...even hateful.

Hermogenes Rojas
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I have to admit to a palpable feeling of shock on reading the words of bioethicist John Harris that "[i]f increased life expectancy is a good, should we deny palpable goods to some people because we cannot provide them for everyone? We do not refuse kidney transplants to some patients because we cannot provide them for all, nor do we regard ourselves as wicked because we perform many such transplants, while low-income countries perform few or none at all."

This argument seems ethically equivalent to the bald claim that an action is permissible because everyone is doing it. Surely bioethics runs deeper than that. It may well be that future society will not be capable of preventing healthy immortality for some alongside a squalid foreshortened mortality for others. The point is that as a bioethicist, Harris should be decrying that possibility, not justifying it.

Immortality is not equivalent to "a new kidney but more of it." It is a qualitatively different arena entirely. Kidney transplant patients eventually die. They are like the rest of us. Immortals do not die. They are different. It is not conceivable that a society could survive if composed of an admixture of mortals and immortals. Resentment would be inflamed, with every death from enfeebled old age juxtaposed against the ageless vitality of the privileged. The mixture could only produce warfare or oppression.

It would be better to suggest that with the immortality that is just over the horizon, human societies ought to stop wasting their time playing mindless games of national and sectarian domination and instead pay attention to worthwhile issues such as bringing the benefits of education and worthy life to everyone.

That's not to say that this will happen. It's to say that people such as Harris ought to be encouraging it to happen and even attempting to invent mechanisms to make it happen, rather than exculpating the birth of a horrid future with a shrug of the ethical shoulders and a bland "Well, everyone's always done it."

dEbates!

The letters by Rojas and Frank were selected from *Science*'s dEbates. Read all the dEbates on Harris's Essay at http://www.sciencemag.org/cgi/eletters/288/5463/59

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Response

Phillips provides an amusing dialogue, the burden of which is that possible controls I suggested in my Essay would fail. I agree that such controls are unrealistic, but for moral rather than for practical reasons, which is what I tried to suggest. However, if I were disposed to impose conditions on candidates for longevity treatment, I'd make jolly sure that they signed the contract before treatment rather than try vainly to get them to agree to terms after the event.

Rojas suggests that "the notion of mortality...is the engine that propels us to do our best to grow as better individuals. The certainty that life is short and time can't be wasted is and always will be the incentive for all the seekers of truth." This may be true, and nothing in my Essay argued otherwise, although I myself believe that those who love truth and goodness will pursue it however long they have so to do and those who don't are not much influenced by the prospect of death. My point has not been about whether longevity is an unalloyed good, but rather, whether we may legitimately prevent those who seek it from achieving their aim. The burden of the argument of my Essay was that it is unlikely that we could justify controls on longevity treatments, however desirable

we thought such controls to be. It is interesting to me as a nonscientist that so many scientists (I unjustifiably assume Rojas to be one) feel free to assert the truth of untested speculation. It may be that mortality is "the engine that propels us to do our best," but the only way to test such a hypothesis is to create some immortals and see what difference it makes.

Finally, Frank confesses to feeling shock at my Essay. I commented that, if increased life expectancy is a good, then justice does not require that if we cannot do good to everyone, we should do it to no one. In response, Frank says, "This argument seems ethically equivalent to the bald claim that an action is permissible because everyone is doing it." My argument was about justice and respect for persons. I nowhere suggested that longevity is a good, but put the point in conditional form. If longevity is a good, then neither justice nor respect for persons demands that when we cannot provide a good for everyone, we should provide it for no one. When I pointed out that "we do not refuse kidney transplants to some patients because we cannot provide them for all," I was illustrating the wide acceptance of this truth but, of course, wide acceptance of kidney transplants does not make them good. They are good because they save lives. As for Frank's suggestions as to what I should and should not approve of, they do not appear to be based on the essence of my arguments. I nowhere suggested that things are OK because "everyone's always done it," nor do I justify longevity treatments. I simply pointed out some of the ethical problems that will attend attempts to deny such treatments to those that might seek them and the problems that society will face if such treatments become available.

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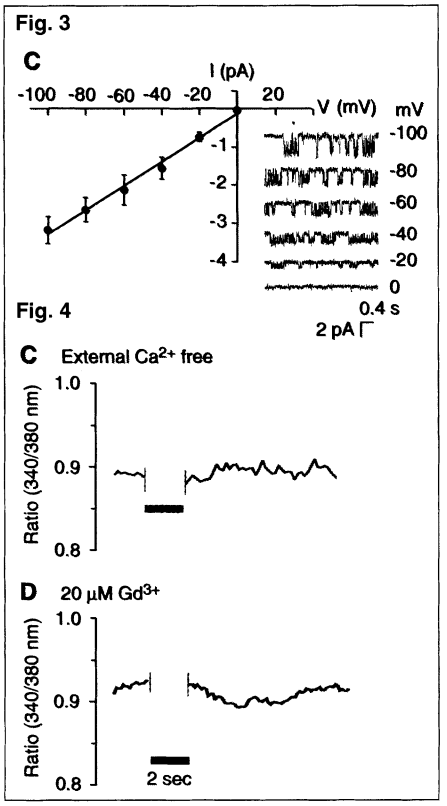
Report Clarification

In the report "Molecular identification of a eukaryotic, stretch-activated nonselective cation channel" by M. Kanzaki *et al.* (6 Aug. 1999, p. 882), we mistakenly presented three incorrect traces in Figs. 3 and 4.

In Fig. 3C, the trace at –100 mV was wrong. When we performed this experiment, we saved each trace obtained at various holding potentials in two ways, using Igor Pro (wave matrics). First, we picked up an area (5 s by 10 pA) and pasted it into an area of 13 cm by 7 cm (Series 1). Next, we picked up an area (6 s by 9 pA) and pasted it into an area of 13 cm by 7 cm (Series 2). As a result, the traces of Series 2 were compressed in width and enlarged in amplitude compared with the traces of Series 1. We made the two separate series of data so that we could compare the two series of traces and select the one with better appearance. When making the final version of the traces as an insert for Fig. 3C, we used the traces at 0, –20, –40, –60, and –80 mV from Series 1, but for the –100-mV trace, we incorrectly used the trace at –80 mV from Series 2 instead of the trace at –100 mV of Series 1.



The trace of Fig. 4C was also wrong. During arrangement of the final version of this panel, we placed Fig. 4A instead of the true Fig. 4C. A corrected panel was published earlier (Corrections and Clarifications, 3 Sept. 1999, p. 1493).

In Fig. 4D, we took part of the original control data (which appeared in panel A) by mistake and processed it with a running average method.

The correct traces are shown here. We deeply apologize for having presented the erroneous figures and thank the readers who pointed out the mistakes.

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Editors' note

The above explanations were received after several exchanges with the authors.