BIOL 1010 Introduction to Biology: The Evolution and Diversity of Life. Spring 2011
Sections A & B

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First a short diversion before the main lecture . . . . Many of you wondered about that human sexuality extra credit essay question. So let’s talk about that for a bit before anything else.
The human female is unique among mammals in that she goes through menopause during midlife; that is her ovaries dramatically reduce the amount of hormones being produced, which in turn shuts down her menstrual and ovulation cycles, and the possibility for conception. This happens well before the natural lifespan of humans, usually starting in the late forties and ending in the early to mid-fifties. Other species that do have a cessation of ovulation do so much closer to the end of their natural lifespan.

Why could this be? Seems like natural selection would select against this trait, allowing human females to procreate well into their old age, not shutting her down in midlife. You need to use sound evolutionary reasoning in your answer — try to think of any evolutionary advantages this may confer the human species (and therefore, it’s genes).
“Why” answers could include . . .

A combination of at least these four commonly touted hypotheses:

1. A quite simplistic idea involves the rigor of human childbirth . . . that it requires very healthy, and hence young women, to survive the ordeal. Human babies are bigger, and have bigger heads, proportionately than any other animal. But it seems like natural selection would favor having just one more child regardless of the outcome, even death, for the woman. It’s all about offspring.

2. And another aspect of the same argument has to do with the prolonged care and length of time necessary to rear human children. A mother in her old age would die before her youngest child, and probably intermediate children, had matured enough to take care of themselves. The odds for both point one and two become worse with increased age. But this still begs the question . . . even without a living mother, one more child is increased reproduction of the species, especially in that tribe.
3. The “Prudent Mother” or “Grandmother” hypothesis posits that women that would likely die in old-age childbirth are prevented from doing so by menopause because they are subsequently available for the childcare and food gathering needs of their grandchildren. These grandchildren share 1/4th of her DNA, so natural selection of “selfish DNA” has occurred.

4. An extension of these “inclusive fitness,” “kin selection,” “selfish genes” ideas is that these grandmothers are able to assist not just with their grandchildren, but altruistically with the entire tribe’s children, with whom she shares at least some of their genes.

As Jared Diamond explains in Why is Sex Fun? “she can do more to increase the number of people bearing her genes by devoting herself to her existing children, her potential grandchildren, and her other relatives than by producing another child.” Very interesting . . . .
But none of these evolutionary hypotheses involve . . .

Any sort of technology or potential overpopulation — the midlife menopause trait evolved WAY before any of these had anything to do with humans, a million or so years ago, probably even before Homo sapiens, most likely in Homo erectus or Homo ergaster or even earlier. It is not a recent change!

Furthermore, it’s not that we just live longer now and evolution hasn’t had the time to ‘catch up’ with our longer life spans. This can’t be valid because every other biological function of women continues to operate into her old age. Why would only fertility shut down?

And, not only that, but other mammals (and reptiles and birds too) that have very long life spans and very few offspring (and many do) don’t do this. Why just the human animal? And, yes, we are a mammal, which is an animal. No doubt!
Another often repeated idea had to do with . . .

Evolution having foresight — that it can ‘predict’ the future, such that something that would evolve to reduce the birth rate, such as midlife menopause, has evolved to help prevent species (and genes) from hitting their carrying capacity too hard and crashing (like the Reindeer on St. Matthews).

Thing is, evolution is very Zen that way, it is totally here and now. It doesn’t know the past, and can’t know the future — “be here now.” What works, in whatever way, to try to make more of that species (and its genes), in this particular time and place. That’s what evolution is!
And just some random thoughts that came to me while reading all these essays . . . .

There is very little proof that humans died significantly earlier in prehistoric times. Sure recent medical technology has extended our life, but, as explained two slides ago, this trait evolved a million or so years ago, not a thousand or so years ago.

Women (and men) in their 50’s do NOT have a significantly reduced sex life! How often do you ‘get it on,’ compared to me?

Menstruation has nothing to do with “cleansing” of the women’s reproductive system. So this can’t have anything to do with it.

And almost last, and certainly not least, read the question on any exam — I had several people answering last semester’s question!

Finally, “there,” “their,” and “they’re” are VERY different words; and the possessive form of a noun has an apostrophe!
On to... Human impact on the biosphere.

I’ll let Sir David Attenborough do much of the lecturing on this topic in a really nice video that covers global warming, perhaps the most serious human impact on the biosphere.

But before that, what about all these humans? Sure are a lot of us!
The earth’s human population continues to explode.

* As of April 5, 2011, the Earth’s population is estimated by the United States Census Bureau to be 6.91 billion (mostly along the coastlines and along major river systems).

* China and India account for one third of all humans.

* For much of human history, population growth has been exponential (notable exception in the late 1300’s due to “Black Death”).

* The population growth rate peaked in the 1950’s, 60’s and 70’s and has slowed in recent years.

Here's a graph of that growth.

See http://www.youtube.com/watch?v=4BbkQiQyaYc
And of the rise and fall of the rate of growth, since 1950 worldwide.

But the projected growth is very different in different countries based on economic development. This is called...
Demographic transition.

* Birth and death rates shift from high to low in different parts of the world at different times.

* In the first stage birth and death rates are both high (low population growth).

* In the second stage death rate lower due to improved living conditions, but birth rates remain high (rapid population growth).

* In the third stage birth rates fall and death rates remain low (population stable or even declining due to more deaths than births).
The demographic transition graphically:

Also see http://www.globalchange.umich.edu/globalchange2/current/lectures/human_pop/human_pop.html
What affects this?

* Factors affecting birth rates include . . .
* Family planning programs, delayed childbearing, and government policies.
* Factors affecting death rates include . . .
* Improved public health and medical technology, plus decreases in mortality from cancer and heart disease have steadily raised life expectancy. However, the . . .
* AIDS epidemic has significantly affected mortality, especially in Sub-Saharan Africa.
The situation is worst in Sub-Saharan Africa!

Also see: [http://www.youtube.com/watch?v=mogTwwepces](http://www.youtube.com/watch?v=mogTwwepces)

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**Table 39.3 The AIDS Situation in 2006**

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Adults and Children Living with HIV in 2006 (Estimated)</th>
<th>Number of Adult and Child Deaths due to AIDS in 2006 (Estimated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>24,700,000</td>
<td>2,100,000</td>
</tr>
<tr>
<td>South and Southeast Asia</td>
<td>7,800,000</td>
<td>590,000</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>1,700,000</td>
<td>84,000</td>
</tr>
<tr>
<td>Latin America</td>
<td>1,700,000</td>
<td>65,000</td>
</tr>
<tr>
<td>North America</td>
<td>1,400,000</td>
<td>18,000</td>
</tr>
<tr>
<td>East Asia</td>
<td>750,000</td>
<td>43,000</td>
</tr>
<tr>
<td>Western and Central Europe</td>
<td>740,000</td>
<td>12,000</td>
</tr>
<tr>
<td>North Africa and Middle East</td>
<td>460,000</td>
<td>36,000</td>
</tr>
<tr>
<td>Caribbean</td>
<td>250,000</td>
<td>19,000</td>
</tr>
<tr>
<td>Australia and New Zealand</td>
<td>81,000</td>
<td>4,000</td>
</tr>
</tbody>
</table>

Source: UN AIDS Epidemic Update, December 2006
A nice visual aid from National Geographic (2005)

Sub-Saharan Africa
Two-thirds of all people in the world with HIV/AIDS live here.

Each square represents 10,000 people living with HIV/AIDS in 2003.

Country where 10% or more of population lives with HIV/AIDS

SOURCE: UNAIDS
NG MAPS

Also see: http://www.unfpa.org/aids_clock/
Human population growth has significantly impacted environmental quality! An example is access to fresh water. And today’s video on global warming!
Here’s the video, hosted by Sir David Attenborough, presented on the Canadian Broadcasting Corporation CBCNewsWorld’s “the Passionate Eye.”


* [And the news story about it: http://www.cbc.ca/passionateeyesunday/feature_240906.html](http://www.cbc.ca/passionateeyesunday/feature_240906.html)

The video is fifty minutes; it’ll last the rest of the class period. The final will have a question or so from it.
The comprehensive final (no makeups, period!) . . .

✓ Biol 1010 A (i.e. Tues/Thurs at 11:00 AM): Friday, May 6, from 10:15 AM to 12:15 PM, in BSC 3009.

✓ Biol 1010 B (i.e. Mon/Wed at 3:30): Friday, May 6, from 5:00 PM to 7:00 PM, in BSC 3009. Sorry, sure as hell not my choice!
Don’t forget . . .

The next class meeting is very important. It will cover all topics that have been troublesome over the entire semester, as a review for the final. And the final in-class assignment is due then. In fact, here it is: For next time, write down three questions from previous exams that you don’t understand or are most confused by. Bring those three questions to the next class meeting, and don’t blow it off. It’s a VERY worthwhile preview for the final exam!