

# FOCUS



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## Reflections on Becoming a Doctor

*With the excitement of graduation in the air, Focus put this question to members of the Class of 2010: What about your experience of becoming a doctor has surprised you most? Students' thoughtful reflections follow.*

If people were to ask me about my time at HMS, I would probably begin with the young girls I mentored in an afterschool program during my first year. They might hear about the summer I spent in South Africa conducting a survey on anti-HIV therapy or the time I spent in El Salvador teaching reproductive health to adolescents. Maybe I would talk about my experience interviewing ex-prisoners about their medical care while incarcerated. But I would not miss an opportunity to mention the dear friends I have made, the amazing faculty that I have worked with and my opinion on the best restaurants in the North End. Some of my most memorable medical school experiences occurred beyond the Longwood Quadrangle and even this country. The most surprising thing about HMS is not what you can do inside the classroom, but rather what you can do outside of it. —Chirisse Taylor

I never anticipated the extent to which the age-old “oral tradition” of passing information plays a role in medicine. Everything from taking a good history on a patient  
*See “Students’ Reflections,” page 2*

## A Neanderthal Chronicle

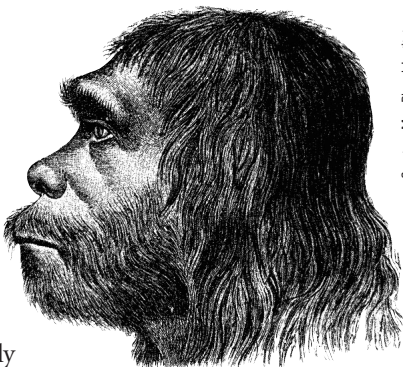
*Ancient DNA Shared by Modern Humans Outside Africa*

A preliminary draft of the genome of the Neanderthal, our closest evolutionary relative, reveals in exquisite detail how this long-extinct member of the *Homo* genus relates to modern humans.

The work for the project was carried out in two phases. In the first phase, scientists at the Max Planck Institute in Leipzig, Germany, extracted a genome’s worth of DNA from bones approximately 40,000 years old, taken from a cave in Croatia. In the second phase, an international consortium analyzed the data to study how Neanderthals are related genetically to modern humans. A key analysis—led by HMS associate professor of genetics David Reich—revealed that Neanderthals interbred with ancestors of modern Europeans and Asians, but not Africans.

“Europeans and East Asians today bear a closer relationship to Neanderthals than do Africans,” said Reich. “One to four percent of the genomes of non-Africans trace their ancestry to Neanderthals. Europeans and Asians both have this signal, indicating that the gene flow occurred at least 45,000 years ago, before these two populations’ ancestors separated.” These findings are published in the May 6 issue of *Science*.

*See “Neanderthal Chronicle,” page 7*



## Focus on Primary Care

Addressing a near-capacity crowd in the Joseph B. Martin Conference Center, HMS dean Jeffrey Flier said, “Tonight I’m not here to talk about my views on primary care. I’m here to listen.”

The May 13 event, a town meeting on primary-care training and education, provided an opportunity for the Primary Care Advisory Group (PCAG), which Flier commissioned last year, to present the dean with its official recommendations on how the School can strengthen and enhance its primary-care educational programs. The meeting also

*See “Primary Care,” page 7*

## International Health Aid: Following the Money

*First Systematic Look Taken at Budget Impact in Developing Countries*

New research shows that governments of developing countries have doubled their public spending on health overall, reaching \$18 billion in 2006 (with some notable exceptions). And in most countries on average, a recent doubling of global health aid has added even more to the bigger domestic health budgets, according to the first systematic study to ask: Where’s all that money going? What’s the budgetary impact?

“This is a big change since a decade ago,” said Julio Frenk, dean of HSPH, who was not an author on the paper. “Health is now seen as a main component of the global agenda. The global health community has managed to persuade the leaders of donor countries of the intrinsic value of health for human rights, security, gov-

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## Neanderthal Chronicle

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### Ancient Ancestors

Neanderthals, who became extinct roughly 30,000 years ago for unknown reasons, and who diverged from modern human ancestors 270,000 to 440,000 years ago, have long been a subject of intense speculation. They are the closest population in the fossil record to anatomically modern humans, yet they are clearly distinct in terms of their physical structure.

Neanderthals had bigger faces than we do, with more barrel-shaped chests and shorter limbs, and were most likely better adapted to colder climates. Their brains, despite being a bit longer with possibly smaller temporal lobes, were generally the same size as ours.

The fossil record shows that modern humans and Neanderthals overlapped geographically for tens of thousands of years in Europe and Asia. From this evidence springs the obvious question: Did the two species intermingle and pool their genes?

**Neanderthal DNA was extracted from these three bones, whose length is shown in centimeters.**



### Distant Cousins

For more than a decade, a group of researchers led by Svante Pääbo at the Max Planck Institute has been attempting to obtain sequences from the Neanderthal genome using pill-sized samples

**“There is a tremendous amount of untapped information in this genome, and we’re going to be spending many more decades getting closer to what it all means.”**

—David Reich

of powder extracted from bone fragments. This type of work is often thwarted by sample contamination (the majority of DNA extracted in such experiments turns out to come from microbes or, sometimes, a hapless laboratory technician). However, the researchers increased the purity of their samples by taking advantage of technological advances that could both detect and filter out contamination of the genetic material.

The result was a reconstruction of more than four billion base pairs of DNA assembled from a variety of cells. This total represents roughly 60 percent of the Neanderthal genome.

An international team of geneticists led by Reich then studied how Neanderthals and modern humans are related by comparing this new genomic data to five present-day humans from far-flung regions of the world. It was in this work that Reich and his colleagues discovered that roughly one to four percent of the genomes of all non-African modern humans are directly descended from the Neanderthal. These modern groups all appear equally related to their distant cousins.

One explanation for this uniform genetic distribution is that interbreeding occurred at the gateway of the migration of modern humans out of Africa in the upper Paleolithic period, roughly 45,000 years ago. From points in north-



**David Reich led a key analysis of the Neanderthal genome during research to determine the genetic relationship between Neanderthals and modern humans.**

ern Africa—that is, present-day countries such as Libya and Egypt—modern humans dispersed throughout Europe and East Asia.

“That’s not the only explanation, but it’s the most likely one,” said Reich.

As far as the researchers can tell, this small percentage of inherited DNA is random. There is no evidence that it is associated with specific traits.

According to Harvard University professor of human evolutionary biology Daniel Lieberman, who was not involved in the study, we should not be surprised at this evidence of interbreeding. “I do not think this in any way lessens the evidence that Neanderthals and modern humans were, indeed, separate species. Closely related species often do interbreed to a limited extent.”

Clearly, the data is a treasure trove for future study. “There is a tremendous amount of untapped information in this genome,” said Reich, “and we’re going to be spending many more decades getting closer to what it all means.”

—David Cameron

For more information, students may contact David Reich at [reich@genetics.med.harvard.edu](mailto:reich@genetics.med.harvard.edu).

## Primary Care

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provided members of the HMS community an opportunity to give their thoughts on the recommendations as well as on primary-care training in general.

Following Flier’s brief comments, advisory group co-chairs David Bates and Russell Phillips, HMS professors of medicine at Brigham and Women’s Hospital and at Beth Israel Deaconess Medical Center, respectively, presented the PCAG’s recommendations. Then Rebecca Berman, HMS instructor in medicine at Massachusetts General Hospital, fielded audience comments.

One audience member said, to an enthusiastic round of applause, “We need to all become advocates of primary care and help HMS raise funds for it!”

According to Flier, “Training physicians who are practitioners and leaders in primary care, including primary care research, education and policy, is a priority of Harvard Medical School. These recommendations will play a key role in shaping our future efforts to strengthen our com-



**From left, pediatrician Gerald Hass, Russell Phillips, and Jeffrey Flier discuss issues in primary care at a recent town meeting on primary-care training.**

mitment to primary care.”

More information on the Primary Care Advisory Group, including a downloadable executive summary of its recommendations, is available on its website ([http://hms.harvard.edu/public/primary\\_care/recommendations.html](http://hms.harvard.edu/public/primary_care/recommendations.html)). The PCAG

subcommittee co-chairs, who led work by the three subcommittees, were Sara Fazio and Jonathan Finkelstein for education; Nancy Rigotti and Mark Schuster for research; and James Perrin and Debra Shapiro for clinical innovation.

—David Cameron