



	<b>Experiment title:</b> Synchrotron Light To Reveal if the Israeli Qafzeh Fossil Children Grew Up Like Us.	<b>Experiment number:</b> EC 204
<b>Beamline:</b> ID 19	<b>Date of experiment:</b> from: 28/09/2007 to: 10/2/2007	<b>Date of report:</b> 26/11/2010
<b>Shifts:</b> 18	<b>Local contact(s):</b> PAUL TAFFOREAU	<i>Received at ESRF:</i>
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### Primary Report:

Smith, T.M., Tafforeau, P., Reid, D.J., Pouech, J., Lazzari, V., Zermeno, J.P., Guatelli-Steinberg, D., Olejniczak, A.J., Hoffman, A., Radovčić, J., Masrour, M., Toussaint, M., Stringer, C., Hublin, J-J. (2010) Dental evidence for ontogenetic differences between modern humans and Neanderthals. Proc. Natl. Acad. Sci. USA 107 (page numbers forthcoming)

### Abstract:

Humans have an unusual life history, with an early weaning age, long childhood, late first reproduction, short interbirth intervals, and long lifespan. In contrast, great apes wean later, reproduce earlier, and have longer intervals between births. Despite 80 y of speculation, the origins of these developmental patterns in *Homo sapiens* remain unknown. Because they record daily growth during formation, teeth provide important insights, revealing that australopithecines and early *Homo* had more rapid ontogenies than recent humans. Dental development in later *Homo species* has been intensely debated, most notably the issue of whether Neanderthals and *H. sapiens* differ. Here we apply synchrotron virtual histology to a geographically and temporally diverse sample of Middle Paleolithic juveniles, including Neanderthals, to assess tooth formation and calculate age at death from dental microstructure. We find that most Neanderthal tooth crowns grew more rapidly than modern human teeth, resulting in significantly faster dental maturation. In contrast, Middle Paleolithic *H. sapiens* juveniles show greater similarity to recent humans. These findings are consistent with recent cranial and molecular evidence for subtle developmental differences between Neanderthals and *H. sapiens*. When compared with earlier hominin taxa, both Neanderthals and *H. sapiens* have extended the duration of dental development. This period of dental immaturity is particularly prolonged in modern humans.

**Figure:** Qafzeh 10 multi-scale imaging.



### **Related Publications:**

Smith, T.M., Olejniczak, A.J., Zermeno, J.P., Tafforeau, P., Skinner, M.M., Hoffmann, A., Radovčić, J., Toussaint, M., Kruszynski, R., Menter, C., Moggi-Cecchi, J., Glasmacher, U.A., Kullmer, O., Schrenk, F., Stringer, C., Hublin, J-J. (in review) Remarkable variation in enamel thickness within the genus *Homo*. Proc. Roy. Soc. B.

Smith, T.M. & Tafforeau, P. (2008) New visions of dental tissue research: tooth development, chemistry, and structure. *Evol. Anthropol.* 17:213-226.

### **Other Notes:**

- Featured in ESRF Press release November 16, 2010 and on [www.esrf.eu](http://www.esrf.eu)
- Numerous international scientific press reports, including Nature, Science NOW (online), Discover, BBC Radio, NPR Radio, Washington Post, UK Inquirer, etc.
- Will be featured in ESRF Newsletter and ESRF Highlights 2010.
- Full length report with images and animations are available here: <http://www.heb.fas.harvard.edu/Press/>