

analysis to social science. Some of its authors have also studied the genetics of happiness, and plan to examine the genetics of fertility and of risk-taking behaviour.

“There’s been a long-standing assumption that [genetic] differences among people are not really relevant for social-science studies,” says study co-author Christopher Chabris, a cognitive psychologist at Union College in Schenectady, New York. “The main effect of this work may be the increasing realization that genetic differences matter, and now people can start to figure out how and why.”

Robert Plomin, a behavioural geneticist at King’s College London, agrees. The study’s authors identified 9 million genetic variants that, as a group, have some influence on school success; these include the 74 genetic markers that show strong individual influence. Considered as part of an overall ‘polygenic’ score, the variants explain 3.2% of the differences in educational attainment between individuals. Plomin says that such studies could pave the way to predictive genetics for traits such as how well children perform on standardized tests.

Still, the researchers estimate that a person who carries two copies of the genetic variant that has the strongest known effect would complete nine more weeks of schooling over a lifetime than a person with no copies.

The authors also report that the markers they found overlap with those associated with better performance in cognitive tests, bolstering the idea that educational attainment is a proxy for intelligence. Because few large studies have tested individuals’ cognitive performance, it has been difficult to discern genetic factors linked to intelligence. But it is much easier to amass large amounts of data that have sufficient statistical power to uncover genetic effects related to educational attainment, because medical studies routinely record data on participants’ years of schooling.

Hsu predicts that growing knowledge of genetic contributions to intelligence could be used to help parents to select embryos created through *in vitro* fertilization. “You could allow the parents to decide whether they want to implant or not implant an embryo that has a serious cognitive impairment,” Hsu says. “What is missing is the ability to know what places in the genome are affecting cognitive ability, but studies like this one will get us to that point.”

But even if all the genetic contributors to educational attainment were known, the study’s authors say, their effect would probably be overshadowed by other factors such as the socio-economic and educational status of a child’s family. Says Chabris, “It would be irresponsible to look at a polygenic score and use it to make a prediction for a single individual.” ■



The tattoos include two seated baboons depicted around a wadjet eye (top row), a symbol of protection.

ARCHAEOLOGY

Sacred tattoos found on Egyptian mummy

Unusual designs include eyes, flowers and animals.

BY TRACI WATSON

A mummy from ancient Egypt was heavily tattooed with sacred symbols, which may have served to advertise and enhance the religious powers of the woman who received them more than 3,000 years ago.

The tattoos are the first found on a mummy from dynastic Egypt to show actual objects, among them lotus blossoms on the mummy’s hips, cows on her arm and baboons on her neck. Just a few other ancient Egyptian mummies sport tattoos, and those are merely patterns of dots or dashes.

Especially prominent among the mummy’s tattoos are ‘wadjet eyes’: possible symbols of protection against evil that adorn the mummy’s neck, shoulders and back. “Any angle that you look at this woman, you see a pair of divine eyes looking back at you,” says bioarchaeologist Anne Austin of Stanford University in California, who presented the findings last month at a meeting of the American Association of Physical Anthropologists in Atlanta, Georgia.

Austin noticed the tattoos while examining mummies for the French Institute of Oriental Archaeology in Cairo, which conducts research at Deir el-Medina, a village once home to the ancient artisans who worked on tombs in the nearby Valley of the Kings. Looking at a headless, armless torso dating from 1300 BC to 1070 BC, Austin noticed markings on the neck. She soon realized that they were tattoos.

Austin knew of tattoos discovered on other mummies using infrared imaging (M. Samadelli *et al.* *J. Cult. Herit.* **16**, 753–758; 2015), which peers more deeply into the skin than visible-light imaging. With help from infrared lighting and an infrared sensor, she determined that the Deir el-Medina mummy boasts more than 30 tattoos, including some on skin so darkened by the resins used in mummification that they were invisible to the eye. Austin and Cédric Gobeil, director of the French project at Deir el-Medina, digitally stretched the images to counter distortion from the mummy’s shrunken skin.

The tattoos identified so far carry powerful religious significance. Many, such as the cows, are associated with the goddess Hathor, one of the most prominent deities in ancient Egypt. The symbols on the throat and arms may have been intended to give the woman a jolt of magical power as she sang or played music during rituals for Hathor.

The tattoos may also be a public expression of the woman’s piety, says Emily Teeter, an Egyptologist at the University of Chicago’s Oriental Institute in Illinois. “We didn’t know about this sort of expression before,” Teeter says, adding that she and other Egyptologists were “dumbfounded” when they heard of the finding.

Austin has already discovered three more tattooed mummies at Deir el-Medina, and hopes that modern techniques will uncover more elsewhere. ■