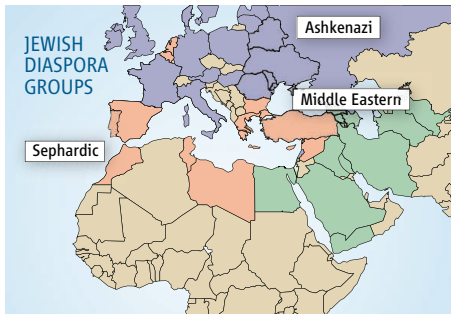

Far-flung family. Ethiopian Jews (*left*) are genetically distant from others but observe Jewish customs.

HUMAN GENETICS

Who Are the Jews? Genetic Studies Spark Identity Debate

The world's 13 million Jews are strongly linked by religion and culture. But do they share a common genetic heritage? Two new studies conclude that most members of the far-flung Jewish Diaspora can trace their roots to ancestors who lived in the Middle East more than 2000 years ago. The new research, based on recent advances in genome technology, apparently refutes controversial claims that most of today's Jews descend from more recent converts. And it finds that Jews in Ethiopia and India who also claim origins in ancient Israel are more distantly related to other Jewish groups. Yet some researchers argue that although science can track Jewish ancestry, it has little to say about who is a Jew today.

The studies "clearly show a genetic common ancestry" of most Jewish populations, says Sarah Tishkoff, a geneticist at the University of Pennsylvania, thus indicating a distinct Jewish people through history. Indeed, says Harry Ostrer, a geneticist at New York University Medical School and leader of one of the teams, the genomewide scans used in the studies can detect Jewish ancestry in anonymous DNA samples. But Doron Behar, a geneticist at the Rambam Health Care Campus in Haifa, Israel, and lead author of the second report, argues that genes do not necessarily make the Jew. There is no "metaphysical" difference between someone born Jewish and a convert to Judaism, Behar says.

The two studies—one led by Behar and published online this week in *Nature*, and Ostrer's, published last week in *The American Journal of Human Genetics*—speak to a current debate about Jewish origins, including that of the Ashkenazi Jews of Europe, who make up 90% of American Jews and nearly 50% of Israeli Jews. Tel Aviv University historian Shlomo Sand's 2008 book *The Invention of the Jewish People* argued that few modern Jews can trace their heritage to ancient Israel. He in part resurrects a thesis, made famous by writer Arthur Koestler in the 1970s, that Ashkenazi Jews are actually descended from a Turkic people in Central Asia whose rulers converted to Judaism in the 8th century C.E.

The new studies contradict that conclusion. Both teams used DNA microarrays to examine variation within Jewish groups worldwide and between those groups and non-Jewish populations. Microarrays allow comparisons of thousands of genetic differences, from single nucleotide pairs to longer stretches of DNA, between different individuals (*Science*, 21 December 2007, p. 1842). This genomewide approach is much more powerful than previous analyses of Y chromosomes and mitochondrial DNA, which were often inconclusive.

The Ostrer team analyzed nuclear DNA from 237 Jews representing the three main Diaspora groups: Ashkenazi Jews; Sephardic Jews from Spain and Portugal; and Middle Eastern, or Oriental, Jews. Their DNA was compared with that of about 2800 presumably non-Jewish people from around the world. The Behar study employed smaller sample sizes—121 Jews and 1166 non-Jews—but from more population groups and also analyzed 8000 non-Jewish Y chromosomes and 14,000 mtDNA genomes.

The studies came up with very similar results: Jews from the three Diaspora groups were closer to each other genetically than to non-Jews from the same geographic region. Indeed, the Ostrer study found that Ashkenazi Jews were as closely related to each other as fourth or fifth cousins, even though their genetic profiles indicated between 30% and 60% admixture with non-Jewish Europeans. Jewish groups also clustered tightly with non-Jewish Middle Eastern populations such as the Druze and the Cypriots, strongly suggesting an origin in that geographic region. "I would hope that these observations would put the idea that Jewishness is just a cultural construct to rest," Ostrer says.

The Behar study also included three Jewish groups whose ancestry has been uncertain: the Beta Israel Jews of Ethiopia, the Cochin Jews of southern India, and the Bene Israel Jews of northern India. It found that all three groups genetically clustered with non-Jewish Ethiopians and Indians rather than with the Diaspora groups. However, analysis of the Y chromosomes of the Bene Israel Jews showed paternal links to the Middle East, suggesting that they might share ancient roots with Jews from that region. So it's possible, Behar and other researchers say, that the Ethiopian and Indian Jewish groups were founded by Jews from other regions who then intermarried and/or converted many local non-Jews to Judaism, thus expanding their numbers but diluting their Jewish genetic signatures.

Overall, "these results confirm the common wisdom that Jews have always held," that they stem from a common Middle Eastern origin and heritage, says historian Anita Shapira, also from Tel Aviv University. "It is nice to get support from modern genetics, which refutes [Sand's] assertions," she says.

Sand counters that the whole concept of identifying Jews genetically is fallacious. "No study … has succeeded in identifying a genetic marker specific to Jews," he insists. He adds, "It is a bitter irony to see the descendants of Holocaust survivors set out to find a biological Jewish identity. Hitler would certainly have been very pleased." But Ostrer says that Sand has not kept up with advances in genetic research: "We can tell who the Jews are genetically." **–MICHAEL BALTER**