

WHO ARE THE JEWS?

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Exercises: J. Geffen

1. The small yellow bird ahead of me drew my attention by its manner of vigorously pumping its tail up and down as it walked. That gave it away as a yellow wagtail, familiar among biologists as a textbook case of evolution in action. At some time in the past, from some Old World center of origin, an ancestral wagtail population spread out to colonize most of Eurasia, from England east to the Bering Strait and from Lapland south to Egypt. The resultant scattered populations all adapted to their new homelands through natural selection. In consequence, the bird's color pattern now varies geographically, permitting bird-watchers to identify a wagtail's place of birth at a glance. Although the individual I was following belonged to a race that breeds in Europe, I was watching it on its wintering grounds in Israel, where a different race breeds and where several wagtail populations now commingle after their ancient diaspora.

2. The site of this commingling was a famous landmark in another famous diaspora: the cliff-top fortress of Masada. There, in the year A.D. 73, during the disastrous Jewish revolt against Roman rule, a group of 960 Jews, after having withstood a year-long siege by a Roman army of 15,000, finally committed mass suicide on the night after their defense wall had been breached. The extreme dryness of the Dead Sea climate preserved features of the battlefield as if it had been excavated only yesterday. Those still-visible features include potsherds used as lots and cast by the trapped Jews to decide the order of their suicide, the eight camps where the besieging Romans had lived, and the ramp that Roman engineers had constructed to reach the summit. As I stood there on a burning hot day in 1992, I could almost feel the ferocious determination that had driven the besieged to hold out for so long in their hopeless situation and that had driven the Romans to mount such a huge effort to crush such a small band of rebels. Jews who survived the crushing of the revolt elsewhere in Palestine scattered over much of the ancient world.

3. On the day I visited Masada, humans as well as wagtails were commingling after their respective diasporas. I was making my first trip to Israel, after my Jewish ancestors had somehow ended up in Eastern Europe before emigrating to the United States. With me on Masada was a group of Ethiopian Jews, a formerly isolated population that underwent a well-publicized evacuation to Israel in the 1980s and 1990s. For the first time in

35 perhaps two thousand years, close contact between the Jews of Ethiopia,
Eastern Europe, and other regions has resumed.

4. The resettlement of formerly scattered groups of Jews in Israel is another
textbook case of evolution in action. Not only wagtails but also humans adapt
to local climate through natural selection. Although the Jews have been
40 scattered for only a few thousand years, their faces often reflect their scattered
homelands. The evolutionary changes underlying those different faces can be
much more easily deciphered than changes underlying wagtails' various color
patterns, since we know far more about human genetics than about wagtail
genetics. How are we humans molded by our environments?

45 5. Genetic studies of Jews may resolve a major, long-standing historical
debate. Are the scattered groups of modern Jews really the modified
descendants of ancient Jews of the Old Testament? Or are some groups of them
instead converted Gentiles (non-Jews), and others so diluted by intermarriage
with Gentiles that little remains of their originally Jewish genes? In his book
50 *The Thirteenth Tribe*, Arthur Koestler pressed the view that the Jewish origins
of the Ashkenazim (the Eastern European Jews, constituting most Jews alive
today) are a myth. Instead, Koestler argued that the Ashkenazim are
descendants of a Turkic tribe, the Khazars, who converted to Judaism in the
eighth century A.D. In Koestler's words, "This would mean that their [the
55 Ashkenazim's] ancestors came not from the Jordan but from the Volga, not
from Canaan but from the Caucasus, once believed to be the cradle of the
Aryan race; and that genetically they are more closely related to the Hun,
Uigur, and Magyar tribes than to the seed of Abraham, Isaac, and Jacob." This
view is controversial, to put it mildly.

60 6. There are also practical reasons for interest in Jewish genes. The state of
Israel has been going to much expense to support immigration and job
retraining of Jews who were persecuted minorities in other countries. That
immediately poses the problem of defining who is a Jew. For example, a debate
is going on right now in Israel concerning policy toward Ethiopia's remaining
65 would-be immigrants who identify themselves as Jews. Are they descendants of
ancient Jews, as they maintain, or are they descendants of converted Africans,
as their physical appearance might suggest?

7. As background for understanding these questions, let's begin with a crash
course in Jewish history. The earliest surviving accounts of the Jews date from
70 the second millennium B.C., when Jews were one of many Semitic peoples in

the Near East. During the tenth century B.C., their political power reached its height, under King David and King Solomon, in a state that was eventually destroyed by the Assyrians and Babylonians. Nebuchadnezzar's deportation of much of the Jewish population to Babylon in 586 B.C. forcibly initiated the Jewish Diaspora. It continued more peacefully in Greco-Roman times, as Jews spread over most of the Mediterranean Basin as traders and farmers. Further, violent diasporas took place when the Romans crushed Jewish revolts in A.D. 73 and 135 and scattered the survivors. At some uncertain point after those migrations, Jewish communities became established as far afield as Yemen, India, Ethiopia, and even China. For example, by A.D. 300 at the latest, Jews had reached Yemen, which was actually a Jewish kingdom for much of the fifth and early sixth centuries A.D.

8. In northern Europe, Jewish merchants under Charlemagne began settling in France and the Rhineland in the eighth century A.D. Beginning about A.D. 1290, however, Jews were expelled, in turn, from England, France, and Germany, and finally, in 1492, from Spain. The exiles from Spain fled mainly to North Africa and became today's Sephardic Jews, while those from northwestern Europe moved eastward to Poland, Lithuania, and the Ukraine to become the Ashkenazic Jews. In the 1880s, Jewish emigration from Eastern Europe to the United States accelerated, culminating in the decade 1900-1910, when more than 100,000 Jews annually (including my grandparents) reached the United States from Russia alone. Most of those who remained in Eastern Europe were killed in the Holocaust during World War II. Following the establishment of the state of Israel in 1948, millions of Jews surviving elsewhere in Eurasia and North Africa emigrated to Israel; virtually all of Yemen's 50,000 Jews were air-lifted to Israel in 1950 by Operation Magic Carpet. Among the largest of these emigrations is that of Russian Jews, still in progress. Today, about 82 percent of the world's Jews are descended from Ashkenazic Jews, 11 percent from Sephardic Jews, and 7 percent from Oriental Jews.

9. In addition to these population movements, Jews have become Gentiles and vice versa through conversion and intermarriage. No one questions that at least the *Khazar* and *Yemenite* rulers converted to Judaism, or that there were also conversions of Moroccan Berbers, other Mediterranean peoples, and Ethiopians. What remains unclear is whether the conversions involved much of these populations or were mainly limited to the ruling classes. Similarly,

intermarriage is extensive now: about one-third of American and European Jews today are marrying non-Jewish spouses. But how much intermarriage was there in the distant past? To what extent have conversions and intermarriage diluted the original Jewish contribution to the genes of those identifying themselves as Jewish today?

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10. Before modern methods of identifying single genes became available, anthropologists tried to pinpoint Jewish relationships by the traditional anthropological indices of head measurements and skin, hair, and eye color. While these characteristics are strongly influenced by genes, they each have the disadvantage of being under the control of many genes rather than of just one. In addition, the genes involved and their mode of inheritance are unidentified, and some of these traits (especially skin color) may fluctuate with environmental conditions (such as exposure to sunlight) during a person's life. At any rate, each group of Jews resembles, in each of these traditional anthropological traits, the Gentile "host" population among which that Jewish group lives. Just as ethnic Germans tend on the average to be more fair-skinned than ethnic Egyptians, Ashkenazic Jews also tend to be more fair-skinned and more likely to have blond hair and blue eyes than are Sephardic Jews from the Mediterranean. In turn, the Jews of Ethiopia and India are, on the average, darker-skinned than Mediterranean Jews, just as ethnic Ethiopians and Indians are usually darker than Egyptians. Does this suggest extensive intermarriage and conversions?

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11. This tentative conclusion seemed to be reinforced by studies of some of the single-gene markers that began to become available in the 1940s. For instance, a genetically controlled deficiency of the enzyme G6PD (glucose-6-phosphate dehydrogenase) is rare among Ashkenazic Jews and Eastern European Gentiles, but common among Mediterranean Jews and Gentiles. In addition, a specific variant of the enzyme phosphoglucomutase occurs with a frequency of only about 21 percent among both the Ashkenazim and Eastern European Gentiles, but at a higher frequency of 26 to 32 percent among both Mediterranean Jews and Gentiles. As still a third example, each Jewish population's ABO blood groups (a set of genetically determined chemicals that reside on the surfaces of our red blood cells and other cells, and whose relative frequencies vary greatly around the world) resemble those of the Gentile host population. Yemenite Jews and Arabs share a low frequency of the gene for blood group B (about 8 percent); Ashkenazic Jews and Germans, a medium

frequency (about 13 percent); and Bombay Jews and Indians, a high frequency (about 20 percent). Even within Europe itself, those countries with high
145 frequencies of the B gene in their Jews tend to be the ones with high frequencies in their Gentiles.

12. On the face of it, these facts seem to suggest that being Jewish is more a matter of belief than of genes. A 1975 book expressed this view with the attention-grabbing title *The Myth of the Jewish Race*. Perhaps emigrant Jews in
150 the past settled down in their new homelands, made local converts, and intermarried on a massive scale. If so, modern Jews would be a genetic grab-bag of separate peoples now sharing a common religion.

13. Yet other recent genetic studies yielded the opposite conclusion. In their fingerprints, Rhesus blood group frequencies, haptoglobins, and several
155 enzyme markers, Ashkenazic Jews resemble Sephardic and Yemenite Jews and differ from Eastern European Gentiles. Furthermore, in these respects Jews resemble many Gentile peoples of the eastern Mediterranean, such as Samaritans, Armenians, Egyptian Copts, and Syrian, Lebanese, and Palestinian Arabs.

14. If one had only this latter evidence, one would conclude that Jews are a
160 typical eastern Mediterranean people who have carried their Mediterranean genes with them and remained distinct from the new groups of local Gentiles they encountered as they drifted away from the Mediterranean. Jewish conversions of non-Mediterranean peoples, and intermarriage with them, would
165 have been slight. The supreme irony of recent Arab-Israeli conflicts would then be that they have been internecine wars between peoples joined by blood and by their closely related Semitic languages. (In Merritt Ruhlen's *Guide to the World's Languages*, Hebrew and Arabic are assigned to the same sub-sub-sub-subgroup of the Afro-Asiatic language family.) But how is the evidence of
170 fingerprints and Rhesus blood groups to be reconciled with the contradicting evidence of skin color and ABO blood groups?

15. The implicit assumption in our reasoning so far has been that genes trace
175 ancestry and nothing else. If my genes are similar to your genes, we must be related; if they're different, we must be unrelated. More specifically, we've tacitly assumed that blood groups and other genetic markers are what are known as selectively neutral traits: straightforward indicators of genetic origins, uninfluenced by natural selection and passed from generation to generation with unchanged frequencies.

180 16. But of course that's not necessarily true. Among Darwin's most important
insights was his concept of natural selection: depending on the environment,
certain traits permit an animal to survive (and to pass on its genes) with higher
probability than do other traits. Thus, two populations derived from the same
ancestral population may diverge genetically in different environments, while
populations from different ancestral stocks will tend to converge in the same
185 environment. One of the most familiar human examples involves skin color:
tropical peoples tend genetically to have darker skins than temperate-zone
peoples. For instance, equatorial West Africans, South Indians, and New
Guineans resemble each other in their dark skins. (Africans and New Guineans
are also sufficiently similar in hair form and other respects that, when I tried to
190 take a New Guinea friend to lunch in a segregated Virginia restaurant in 1964,
we were asked to leave.) Conversely, modern Europeans, speaking related
languages and probably sharing a common genetic ancestry, exhibit a striking
gradient in skin color from north to south. Perhaps natural selection, rather than
conversion and intermarriage, similarly accounts for the north-to-south gradient
195 in skin color of Jews.

17. Another argument for natural selection is the rate of G6PD deficiency
among Jews and their "host" populations. As in most warm areas of the Old
World, malaria was formerly a major health problem around the Mediterranean.
In response to this chronic, life-threatening danger, Old World peoples evolved
200 various "genetic antimalarials," of which the best known is the sickle-cell
hemoglobin of Africans. These genetic traits offer some protection against
malaria – but at a cost, usually a tendency toward anemia (see my article in the
February 1989 issue of *Natural History*). While the benefits outweigh the costs
in heterozygotes (people inheriting the gene from just one parent), the anemia
205 often proves to be crippling or even fatal in homozygotes (people inheriting the
gene from both parents). In malarial environments, the antimalarial benefits to
the more numerous heterozygotes offset the severe disadvantage to the far less
numerous homozygotes. Take away malaria, though, and all benefits of the
gene disappear.

210 18. An example of that effect of natural selection is provided by today's U.S.
blacks. The antimalarial sickle-cell gene in them is less prevalent than it is in
African populations from which we know that blacks in the United States are
descended. Whereas Ashkenazic Jews might conceivably be converted
Khazars, American blacks aren't "converted" whites or Native Americans

215 lacking the sickle-cell gene. However, their low frequency of the gene could
reflect extensive mixing with whites or Native Americans, and that was how it
was initially interpreted. Eventually, though, other African genetic markers
became available, and in their frequencies, American blacks proved closer to
220 African blacks than to American whites, suggesting that their genetic heritage
was not so mixed as had been assumed. Sickle-cell's frequency in New World
blacks is also lower in malaria-free regions than in regions with malaria.

19. For Mediterranean peoples such as the original Jews, G6PD deficiency
rather than sickle-cell is one of the leading genetic antimalarials. Nevertheless,
the reasoning is otherwise similar to that in the case of New World blacks.

225 When Jews arrived in malaria-free Eastern Europe, they would have tended
gradually to lose the G6PD-deficiency gene, even if they had never
intermarried or made converts. That Russian and German Gentiles also lack
this gene does not mean that the populations are related; the loss of the gene
could have developed independently, as has the similar skin pigmentation of
230 black Africans and New Guineans.

20. But what about the ABO blood groups, which were formerly assumed to
be neutral genetic indicators of racial origins? They too are subject to natural
selection because they resemble (are mimicked by?) the antigens of some
bacteria. In consequence, people with certain ABO blood types seem less able
235 to develop antibodies against certain bacteria, and more susceptible to diseases
caused by those bacteria, than people with a different ABO blood group. The
evidence is strongest for smallpox susceptibility of people with blood group A
(see *Natural History*, February 1990, "A Pox Upon Our Genes"). Relatively
speaking, blood groups B and O may be "genetic antismallpoxicals." There is
240 also suggestive evidence that the ABO blood groups affect resistance to
bubonic plague, cholera, and syphilis.

21. If those infectious diseases had always been uniformly distributed over
the world's peoples, they wouldn't have molded ABO blood groups to local
geography. However, as every traveler is well aware, different diseases sprang
245 from different regions: cholera from Southeast Asia, yellow fever from Africa,
and so on. Thus, over thousands of years, the ABO blood groups may have
adapted to the local disease environment, just as skin color adapts to local
climate and genetic antimalarials adapt to the local presence or absence of
malaria. From that perspective, it's unsurprising that Mediterranean peoples
250 differ from ethnic Poles in their ABO blood groups, or that Jews transplanted to

Poland eventually came to resemble Poles in their ABO blood groups (as well as in their skin color and lack of genetic antimalarials).

255 22. Not all genes, though, are strongly influenced by natural selection. As one example, take fingerprints, classified according to the relative frequencies of the different types of wavy lines on your fingers (termed loops, whorls, or arches). To understand the differences, lightly press your own finger on an ink pad, then press your finger on paper, and look at the resultant pattern. The "arches" are the very gently bent lines; the "loops" are the deeply bent lines; and the "whorls" are the lines closed in a circle.

260 23. Peoples indigenous to different parts of the world turn out to differ genetically in their relative frequencies of loops, whorls, and arches. For instance, Jews, Arabs, southern Italians, and other Mediterranean peoples have lots of whorls, while northern Europeans have many loops and few arches, and Chinese have as many whorls as loops. Nobody has been able to show that
265 these genetic differences are of the slightest adaptive significance. It's not that loops were better for gripping Viking helmets during the long Scandinavian winter, while whorls help you pick olives in the warm Mediterranean sun. After all, Swedish fingerprints are like those of black Africans, while Jewish fingerprints are like those of Indonesians – despite the gross differences among
270 those people in climate experienced and in life style.

24. Instead, each people acquired its own characteristic fingerprint genes by chance, through genetic drift and the founder effect, and carried those fingerprints around during its migrations. That's why the people of Madagascar still have Indonesian-like fingerprints, 1,500 years after they emigrated from
275 Indonesia to Madagascar. Similarly, the fingerprints of Ashkenazic Jews still resemble those of their ancient Arab and Egyptian neighbors, rather than those of their recent German neighbors, even though these same Jews have by now become thoroughly Germanified in terms of their ABO blood groups. The same conclusion emerges from studies of Rhesus blood groups, haptoglobins, and
280 various enzymes still thought to serve as neutral markers. In these respects as well, Eastern European Jews continue to march with Arabs and to stand apart from their Eastern European Gentile "hosts" of the last thousand years.

25. Thus, judging by neutral markers, the non-Jewish contribution to the Ashkenazic and Sephardic Jewish gene pool has been low. These groups of
285 Jews may really be transplanted Semites, not converted Khazars or products of massive intermarriage. Whether that is as true of Ethiopian, Yemenite, and

Indian Jews remains to be resolved. They are the Jews whose diasporas took them to especially distinctive environments, and who were cut off most completely from Jews of their Mediterranean homeland. Somehow, as a result, they became genetically the most distinctive of Jews and the ones that most resembled their Gentile hosts. That might reflect conversion, intermarriage, genetic drift during their long isolation, adaptation by natural selection to their distinctive new environments – or some still-debated combination of those effects.

290 26. If we accept the predominantly Jewish origin of the Ashkenazic Jews, then their "Gentilization," as evidenced by those adaptive markers, must have developed within the roughly twelve centuries since they settled northwest Europe, en route to Eastern Europe. Jews thus provide a striking example of rapid, recent evolution.

300 27. That conclusion may at first seem astonishing. We hear so often that the Cro-Magnons of 30,000 years ago were virtually identical to modern humans. (How many times have you read that you wouldn't notice a Cro-Magnon if you met one walking along the streets of New York, wearing a modern suit or dress?) We're accustomed to thinking of evolution as operating on a time scale of millions, or hundreds of millions, of years: seven million years to accumulate the differences between humans and chimpanzees; fifty million years to derive big modern horses from little protohorses; and so on. We regularly refer to evolution as a "theory" – as though it were a debatable inference from indirect evidence.

310 28. Actually there is superabundant evidence for animals evolving under our eyes: British moths becoming darker since the Industrial Revolution (industrial melanization), insects evolving DDT resistance since World War II, malaria parasites evolving chloroquine resistance in the last two decades, and new strains of flu virus evolving every few years to infect us. On reflection, it's not the least bit surprising that Ashkenazic Jews of 1993 differ from their Mediterranean ancestors of 1,200 years ago. That's roughly fifty human generations; plenty of time for big changes in gene frequencies to accumulate, even if the average change per generation was only a few percent. Those claims that Cro-Magnons of 30,000 years ago are indistinguishable from us refer only to their skeletons, the sole parts of Cro-Magnons that have survived for us to examine. Many of their nonskeletal parts must have differed greatly from ours. They were unlikely to have had our genetic antimalarials, our gene for

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325 digesting milk as adults, our ABO blood group frequencies, and myriad other genetic traits. Even their bones differed from ours, although not enough to attract attention on the streets of New York. For example, their teeth were on the average slightly bigger, and their skulls slightly thicker.

330 29. As for the claim that evolution is an unproved theory, that's nonsense. Evolution is a *fact*, established with the same degree of confidence as our "theory" of the round earth, our germ "theory" of disease, and the atomic "theory" of matter. Yes, there is lively debate about the particular evolutionary mechanisms that caused particular changes, but the existence of evolutionary change is not in doubt. Our own bodies provide walking evidence.

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EXERCISES

Answer the questions below.

1. How does paragraph 1 relate to the topic this article deals with? Generalize.

Answer : _____

2. How could the author's personal background and the sight that greeted him at the clifftop fortress of Masada lead him to an attempt to investigate the origin of the Jews?

Answer : _____

Choose the best answer.

3. Paragraph 4 would imply that the various Jewish communities inhabiting the different parts of the world
- are in fact converted Gentiles.
 - have remained immune to environmental modifications.
 - look alike.
 - are derived from common stock.

Answer the questions below.

4. To whom does Arthur Koestler trace the origin of Eastern European Jews, and when does he believe this historical event to have taken place?

Answer : _____

5. In the modern world the attempt to define a Jew may run into one very serious obstacle; which one?

Answer : _____

6. What particular sections of the population are assumed to have converted to Judaism in Khazar and Yemen?

Answer : _____

Complete the sentence below.

7. The fact that German Jews were generally more fair skinned than their Sephardic brethren would suggest that in Germany _____

Answer the questions below.

8. What solid medical and scientific facts would lead to the conclusion that the Jewish communities in various parts of the world in fact represent the self-same genetic identity as their host populations?

Answer : _____

9. The underlined expression opposite conclusion in paragraph 13 refers to

(general conclusion, not facts).

Complete the sentence below.

10. The Arab-Israeli conflict would be supremely ironical if _____

Answer the questions below.

11. Assuming that the information provided in paragraphs 15-16 is indeed correct, how would that bear upon the conclusion concerning the origin of the various Jewish communities?

Answer : _____

12. What does the case of U.S. blacks partly losing their immunity to malaria point to? Generalize.

Answer : _____

Complete the sentence below.

13. The gene that seems least susceptible to environmental influence is _____

Answer the question below.

14. What does the underlined expression neutral markers in paragraph 24 refer to? Generalize; do not provide details.

Answer : _____

Choose the best answer.

15. What does the "Gentilization" of the Ashkenazic Jews suggest?

Answer: It suggests that:

- a. evolution is a much slower process than was generally assumed.
- b. immigrant populations will forever retain their ancestral genetic markers.
- c. evolution may be a more rapid process than assumed.
- d. immigrant populations inevitably intermarry with the locals.