

The Tunnels Nobody Can Date

PASSAGE · NON-FICTION

SKILLS TRAINED

Working memory

Delayed recall

Critical analysis

HOW TO USE THIS SHEET

About 28 minutes

- 1 Read the passage twice, slowly. Take about eight minutes.
- 2 Turn to the next page and cover this one. No looking back.
- 3 Write what you remember, then mark it on the last page.

Stand on a gravel fan below the mountains almost anywhere in central Iran and you may see a line of shallow craters running towards a village, evenly spaced, each ringed by a low doughnut of spoil. From the air they look like stitching. They are the maintenance shafts of a qanat: a tunnel, dug by hand, that carries water from an aquifer at the foot of the mountains to fields that may be thirty kilometres away, with no pump and no power behind it but the slope of the ground.

The method is old and exact. A surveyor finds the water table at the head of the valley and sinks a mother well — *madar chah* — sometimes more than two hundred metres deep. From the village end, men called *muqanni* drive a tunnel back towards it, barely wide enough to kneel in, cutting vertical shafts every twenty or thirty metres for air, light and the removal of spoil. The gradient must be gentle enough that the water does not tear the floor out of the tunnel and steep enough that it does not stand still. Hundreds of kilometres of it lie beneath the plateau.

The most celebrated example is at Gonabad, in the north-east, where the Qasabeh qanat runs for roughly thirty-three kilometres from a mother well around three hundred metres deep, and has been delivering water for something close to two and a half thousand years. In 2016 eleven Iranian qanats, Gonabad among them, were inscribed together on the World Heritage list. The culture built on top of them is as ingenious: *badgir* wind-towers that drive moving air down over a water channel to cool a house, and domed *yakhchal* ice-houses that held winter ice through a desert summer.

Qanats are not only Iranian. Oman has *aflaj*, the Sahara has *foggara*, parts of Spain irrigate from the same kind of channel, and the Turpan basin in western China is watered by *karez* that are recognisably the same invention under a different name. The standard account is diffusion: the technique was worked out on the Iranian plateau, probably by the early first millennium BC, and travelled outwards with empire, trade and the movement of skilled men. Polybius, writing in the second century BC, describes underground channels in Media constructed so that nobody could tell where the water had been taken from — the earliest clear written notice of the idea.

The competing account is that an arid world full of alluvial fans and thirsty villages will invent the same tunnel more than once. Some of the Omani aflaj appear to be very nearly as old as anything claimed for Iran, which is awkward for a story requiring one place to teach the other. The argument for independent invention is not that the technique is obvious — it is difficult and dangerous — but that the problem is identical wherever you meet it, the materials are the same everywhere, and a mountain fan with water under it offers few workable answers. On that reading the qanat is less an invention that spread than a solution a particular landscape keeps proposing to whoever is standing in it.

Deciding between the two runs into a difficulty that has nothing to do with argument. A qanat cannot be dated. It is a hole, and a hole contains nothing of its own to measure: no mortar, no timber, no charcoal. Worse, a working qanat is scoured out every few years — the *muqanni* clear the silt, reline weak sections and deepen the mother well as the water table falls. Every surface in a tunnel still in use was last cut by someone who may well be alive. The system may be two thousand years old, and nowhere in it is anything older than a lifetime.

So the dating is done sideways, which is a polite word for inference. Archaeologists date the settlements and field systems a qanat must have fed, read the tax records and travellers' accounts that mention one, and occasionally find a shaft abandoned early enough to have filled up with datable rubbish. Each of these dates something adjacent to the tunnel rather than the tunnel itself. Meanwhile, in villages where the system still runs, a water-master divides the flow between households by the clock, and the shafts are cleared much as they were when Polybius was taking notes.

Cover the passage before you start.

Looking back turns this into a copying exercise. Getting it slightly wrong from memory is what makes it work.

PART A Tell it back

Write down everything you can remember about qanats – how one is built, the example at Gonabad, the disagreement about where the technique came from, and why the tunnels resist dating. Order does not matter. Keep writing until you run out.

PART B 7 questions

- ① What are the main parts of a qanat, and roughly what are the figures given for the one at Gonabad?

- ② Why must the gradient of the tunnel be controlled so precisely in both directions?

- 3 The passage says the dating of qanats is “done sideways, which is a polite word for inference”. What does calling it sideways convey?

- 4 What attitude does the writer take towards the qanat builders, and how is it conveyed without being stated?

- 5 Weigh the diffusion account against the independent-invention account. Which does the evidence in the passage support better?

- 6 Explain why the fact that qanats are still maintained is a problem for knowledge, not merely an inconvenience.

- 7 A conservation team wants to establish whether a particular village qanat is ancient or was dug two centuries ago. Using the passage's reasoning, set out what they could usefully do and what they should not promise.

PART C Mark your own work

Now go back to the passage. Tick every answer you got right. You do not need the same words as the answer below — if you wrote the same idea in your own words, it counts.

- ☐ 1 • A qanat has a mother well (*madar chah*) sunk to the water table at the head of the valley, a hand-dug tunnel running from the village back to it, and vertical maintenance shafts every twenty to thirty metres for air, light and spoil. At Gonabad the Qasabeh qanat runs about thirty-three kilometres from a mother well around three hundred metres deep and is about two and a half thousand years old.
- ☐ 2 • Because the whole system runs on gravity alone and has no lining strong enough to survive fast water. Too steep and the current scours the floor out of a hand-cut tunnel, undermining it; too shallow and the water stops moving, silts up and never reaches the village. The surveyor therefore has to hold a slope narrow enough to keep water flowing gently over tens of kilometres, which is why the work demanded specialists.
- ☐ 3 • It conveys that the evidence never faces the thing being dated. Instead of measuring the tunnel, researchers measure what lies beside it — the settlements it must have supplied, the documents that mention it, the rubbish in an abandoned shaft — and then reason across to the tunnel. The word also carries a faint note of evasion, as though the method were slipping round the back of a question it cannot meet head on.
- ☐ 4 • Plain admiration, kept deliberately undemonstrative. The writer never calls the work heroic; instead the respect arrives through precise detail — a tunnel “barely wide enough to kneel in”, a gradient held across thirty kilometres, shafts that from the air “look like stitching” — and through the dry observation that the technique is “difficult and dangerous” rather than obvious. The closing image of shafts still being cleared as they were when Polybius was writing pays the compliment by implication: the method has outlasted everyone who might have praised it.
- ☐ 5 • Neither is established, and the passage is honest that this is because of a shortage of evidence rather than a shortage of reasoning. Diffusion has the documentary support — Polybius on the channels of Media, and a plateau with hundreds of kilometres of the oldest claimed examples — plus the fact that the technique is hard enough to need teaching rather than guessing. Independent invention has the awkward chronology: Omani aflaj apparently almost as old as the Iranian ones leave little room for one to have taught the other, and the argument that a shared problem with shared materials yields a narrow set of answers is a real one. On balance the Iranian plateau remains the best-attested early centre, but the claim that it is the single origin is weaker than it is usually stated, and the two accounts need not be exclusive — a technique can be invented twice and then spread from one of the two.
- ☐ 6 • Because maintenance destroys the evidence of age as a condition of keeping the thing alive. Dating normally depends on something being left undisturbed: a layer, a beam, a deposit that has sat where it fell. A qanat has no such material to begin with — it is an absence cut in gravel — and what little accumulates is cleared out every few years by the *muqanni*, who also reline the walls and deepen the mother well. So the better cared-for a qanat is, the less it can tell you about itself, and the only qanats that preserve datable material are the failed ones. That inverts the usual relationship between importance and evidence: the systems that mattered most are the least knowable, and conclusions about them have to be built from documents and neighbouring settlements instead.
- ☐ 7 • They should look everywhere except the working tunnel. Useful lines of attack include excavating the settlement and field systems the channel supplies, since fields cannot be older than their water; searching the written record — tax assessments, endowment deeds, travellers'

accounts — for the earliest mention of water reaching that village; surveying for abandoned shafts or superseded branches, which may hold datable rubbish because nobody has cleaned them; and mapping whether the channel's alignment respects or ignores older boundaries. What they should not promise is a date for the tunnel itself. Every surface in a maintained qanat is recent, so the best achievable result is a date by which water was certainly arriving, which sets a minimum age and leaves the maximum open. A confident single figure would be a claim the method cannot support.

FACTS RECALLED IN PART A

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QUESTIONS CORRECT

— / 7

DATE

THE STRATEGY Interleaving

Do not test yourself on one passage until you have finished with it; shuffle it with two or three others and answer questions from all of them in the same session, jumping between subjects. It feels messier and your score on the day will be lower, which is why most people avoid it. The gain is that you have to work out which material a question belongs to before you can answer it, and that sorting step is exactly what fails in an exam when everything arrives mixed up.

WHERE YOU ALREADY DO THIS

Where in your life do you already have to switch between unrelated things at short notice, and sort out which rules apply before you act? What makes that harder than doing one of them for an hour?

FOR THE PARENT OR TEACHER · This sheet trains delayed recall, not reading speed. Let your student read the passage once, then cover it completely before Part A — no glancing back and no prompting, because the effort of hauling a half-remembered fact out of memory is what fixes it there. At this level mark the thinking rather than the wording: the answers given for the inference, tone and analysis questions are one good response each, not the only one.