1. THE PHILOSOPHER'S RUN

IN 245 BCE, Eratosthenes of Cyrene left Athens to take up his position as head librarian at the Museum in Alexandria. Though long-distance travel in antiquity was never a trivial undertaking, a summer voyage to Egypt would have been a pleasant journey. Eratosthenes would no doubt have first made inquiries at Athens' port of Piraeus for passage aboard a freighter. In his time, there was no specialized passenger trade spanning the Aegean: a traveler would simply go down to the waterfront, or perhaps the storefront offices of a reputable shipping company, and ask for passage on a vessel heading toward his destination. For obscure places or sailings out of season, he had to make do with passage to someplace near his destination and complete his journey aboard smaller coastal craft or overland. But in the case of the Athens–Alexandria run, he would have had little trouble finding passage; the route in the mid-third century BCE would have been well plied, with frequent direct sailings by shippers making a good profit.

Vessels leaving Alexandria were weighted down with the wares of the greatest entrepôt in the Mediterranean world: grain and papyrus from the Egyptian countryside; wine from the vineyards around Lake Mareotis; textiles, glass, goldwork, faience, papyrus, unguents, and perfumes from the city's factories; spices, incense, aromatic woods, and other luxuries from Arabia and points east. Athens herself by the mid-third century had already been supplanted by Rhodes as the leading mercantile democracy in the

Aegean. Because Athenian bulk exports to Egypt would have been far more limited than her imports, Alexandrian cargo ships would come home far higher in the water than when they set out. Indeed, Athens' most important exports to Ptolemy's kingdom would not have been her signature products, such as wine, honey, and olive oil, or even books for the Great Library, but intellectuals like Eratosthenes himself.

Ships of the time were small by modern standards: the only Hellenistic-era merchant vessel known to archaeology, the so-called Kyrenia ship discovered off the north coast of Cyprus in 1967, was a four-man island hopper that measured only forty-seven feet long and fifteen wide. Dwarfing that would have been the big grain ships that plied the Egypt–Italy route in Roman times, such as the 180-foot-long, 44-foot-wide *Isis* described by Lucian of Samosata in the second century CE. But such leviathans appeared only late in antiquity, and were exceptional. Most likely Eratosthenes would have booked passage on something far more modest.

The right price bought space on deck to lay a bedroll or perhaps pitch a small tent. Cabins, which were few, expensive, and undoubtedly cramped, were more suited to the wives and daughters of the wealthy, who needed privacy away from the crew and the other passengers, almost all of whom were male. (This, notwithstanding the effect on milady's stomach: an ancient merchantman with its round bottom and small sails—the Kyrenia ship had only about sixty-four square meters of canvas—would have pitched and rolled terribly. This effect would have seemed far worse to those confined onboard in a tiny cubicle.)

To a man in his prime such as Eratosthenes, there would have been no reason to avoid spending his time under the open sky. Moderns can hardly imagine the contrast of breathing clean sea air after sampling the conditions in a typical ancient Greek city, with no internal plumbing, few allowances for public sanitation, and animals and their

waste everywhere. Narrow streets cut city dwellers off from sky and sun; insecurity at night kept them indoors, away from the stars.

But on a quiet sea, with lungs and nostrils unburdened, no responsibilities, and much time on his hands, the traveler with a philosophic bent could find his imagination enlarged. Presented with the night sky, Eratosthenes might have contemplated the cosmological speculations of Thales, Anaximander, Leucippus, and the Pythagoreans. He might have considered the popular theory that the Milky Way, which glowed so brightly at sea, was the remnant of a path through the sky abandoned by the sun. Or he might simply have been impressed with how little was truly known about what he saw above him.

Passage to Africa during the fair-sailing season—roughly, May to October—would have put the seasonal winds behind the ship's sails. After a few days afloat, a different sort of star would have appeared near the southern horizon: a steady gleam that would shine day and night, never setting but rising subtly as the vessel neared shore. At the sight of it most of those aboard would have begun their obeisances to the gods who had secured their safe passage. The beacon of the Lighthouse of Alexandria was, after all, the passengers' first direct glimpse of their destination.

TOWER OF SIGNIFICANCE

There is an island washed by the open sea
lying off the Nile mouth—seamen call it Pharos—
distant a day's sail in a clean hull
with a brisk land breeze behind. It has a harbor,
a sheltered bay, where shipmasters
take on dark water for the outward voyage.

—*The Odyssey,* book IV

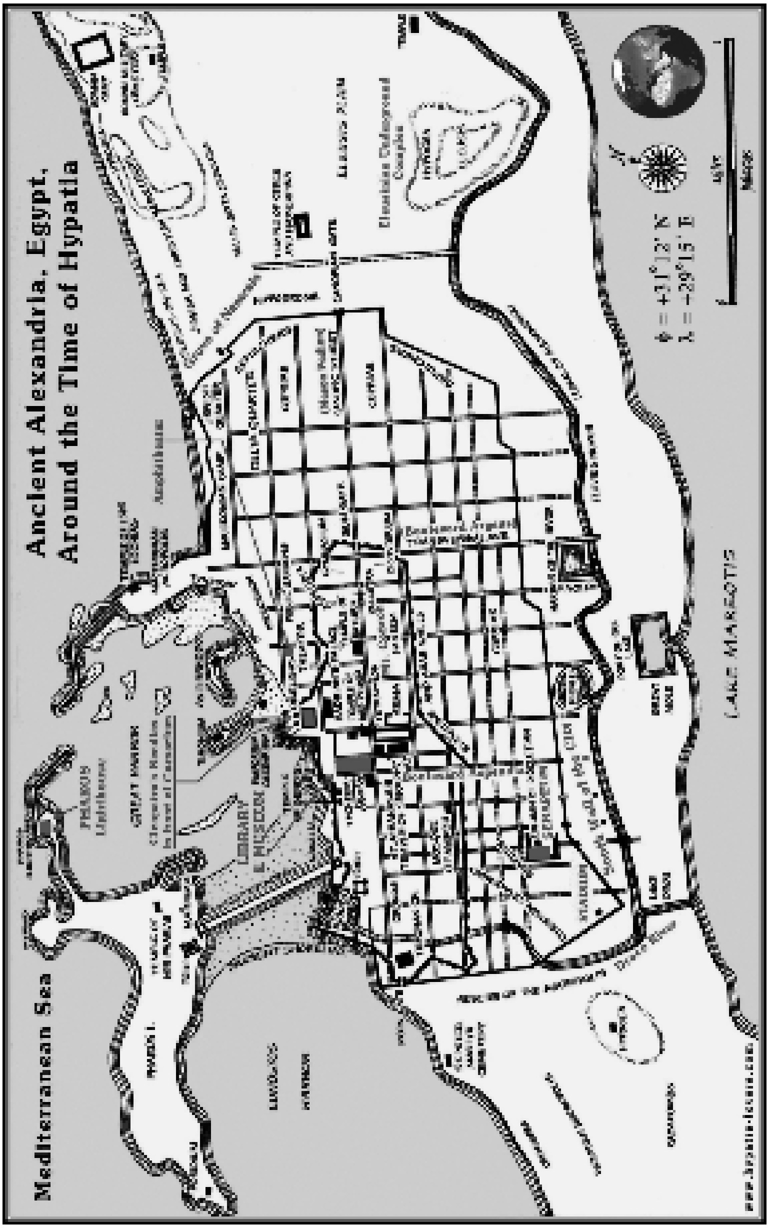

Fig. 1. Street map of Alexandria in the Roman era

The Great Lighthouse (in Greek, Pharos) was for centuries one of the tallest human-made structures on earth. Based on contemporary illustrations and descriptions of its remains, historians know that it was sited on a small natural island (also called Pharos) that was connected to the mainland by a mole (breakwater causeway) that, in turn, separated the east and west harbors of the city (see figure 1). Built of white limestone and pink Aswan granite, the Pharos had a tripartite structure based on a vaguely Pythagorean geometric theme, with a square-sided base, octagonal middle, and circular upper stage. At its very top was mounted a lantern that included a mirror for reflecting sunlight during the day, and for an oil-fed fire at night. At a height of 384 feet, its beacon would theoretically have been visible some thirty miles out to sea—more than a day's sail away. If the Pharos had somehow been plucked off the North African shore and placed on Lake Michigan, it would have topped the Chicago skyline until the construction of the Wrigley Building in 1922.

Dedicated in the early third century at a cost of eight hundred talents, the Lighthouse was one of the first monumental structures completed after the city's founding. Its manifest purpose was to compensate for the lack of landmarks for navigating the northwest Egyptian coast, though its utility as a lookout (and, if legend is to be believed, for burning ships at a distance with its great mirror) would have been a useful bonus. As such it represented an innovation: while towers had been built elsewhere, and human-made landmarks, such as the gleaming bronze helmet of Athena Promachos on the Athenian Acropolis, had incidental uses in navigation, the Pharos was probably the first structure expressly designed for that purpose. There was nothing in mainland Greece to compare to it.

It therefore comes as something of a surprise that the first known catalog of the Seven Wonders of the ancient world, that of

Antipator of Sidon (c. second century BCE), did not include the Pharos. Instead, Antipater preferred to list the Walls of Babylon. It wasn't until the first century CE that the practically minded Romans, specifically Pliny the Elder, included the Lighthouse among the canonical seven (along with the Pyramids of Giza, the Hanging Gardens of Babylon, the Mausoleum of Halicarnassus, the statue of Zeus at Olympia, the Colossus of Rhodes, and the Temple of Artemis at Ephesus). The Lighthouse was so well constructed, however, that it was among the last Wonders to vanish: Arab travelers describe at least part of the tower surviving well into the medieval period. The rest of the Pharos finally succumbed to earthquakes in the early fourteenth century CE. Underwater surveys of the area northeast of the island clearly show remnants of the tower toppled in that direction, with more than two thousand of its blocks littering the harbor bed.

Yet, like many landmark structures in history, the Lighthouse towered as much in symbol as in physical height. It was a practical expression of the self-aggrandizing impulse that inspired other megastructures in the new Hellenistic kingdoms, such as the renovated Temple of Apollo at Didyma, or the Mausoleum of Halicarnassus. Like the buildup of super-tall skyscrapers along the Asian rim in our own time, architectural gigantism followed the accumulation of sufficient money and political confidence to make such gestures. Sure enough, the Pharos's visibility was fully exploited to advertise the splendor of the Ptolemaic state: much of what we know about its appearance is based on its representation on coins, lamps, and other souvenirs, where it was reproduced as frequently as the Statue of Liberty is today (see figure 2). More to the point, its ingenious design, which anticipated the setback designs of modern masonry skyscrapers by more than twenty centuries, might have represented the first practical fruit of research done at the institution Eratosthenes had come to join—the Museum.

Fig. 2. Bronze coin from the reign of the Roman emperor Hadrian, depicting the Pharos, right, and Isis, the patron goddess of sailors

The beacon would have had another significant implication to an informed mind like Eratosthenes'. Its visibility from far out at sea, when the rest of the coast appeared to lie below the horizon, was as graphic a demonstration as possible of the curvature of the earth's surface. This would (or should) have ruled out competing models of the planet's shape, such as Thales' disk, Anaximander's flat-topped column, and Leucippus's kettledrum. One of the key assumptions of Eratosthenes' measurement of the earth's circumference—that the planet is spherical—would have been reinforced in his mind even before he set foot on Egyptian soil.

INTO THE BIRDCAGE

> *Many are feeding in populous Egypt, scribblers on papyrus, ceaselessly wrangling in the birdcage of the Muses.*
>
> —TIMON OF PHLIUS (c. 320–230)

The final approach to the city would have presented the ship's passengers with a panorama of Greek ingenuity. The city's *Greek* character deserves emphasis: though Alexandria was located in the enviably rich kingdom of Egypt, and Egypt had been respected for centuries (along with Babylonia) as the font of all ancient wisdom, there never seemed any prospect of constructing a capital that actually *looked* authentically Egyptian. The ambiguous relationship of the capital to the rest of the country was obvious even to outsiders: the Romans, who knew a thing or two about the geography of power, called it Alexandria ad Aegyptum, or "Alexandria *near* Egypt," not in it.

To be sure, the Ptolemies did commission massive new temples in the ancient style, largely to help the Macedonian rulers ingratiate themselves with their native subjects. But those constructions stood upriver, at such places as Dendera, Edfu, and Philae. The Greeks had also plundered interior sites, such as Heliopolis, for sphinxes, obelisks, columns, and so on, with which to decorate their public spaces. These appear to have been spread about, out of context, like titanic bric-a-brac, in a manner that would have struck the natives as highly irreverent—Egyptianizing instead of Egyptian. (The twin seventy-foot "Cleopatra's Needles"—obelisks—were first installed in Alexandria just after the Ptolemaic period, and subsequently shipped to the West. They are now mounted on the Thames embankment and in Central Park in New York, largely for the same reasons the Ptolemies had for displaying them.)

Strabo offers the best surviving description of the city in its heyday. Approaching from the north, Eratosthenes' ship would likely have made for the mouth of the eastern or Great Harbor, which was bound by Pharos Island on the west and on the east by the promontory of Lochias. The pilot would have had to proceed carefully around the rocks that either stuck their heads above the water or lay just below the surface—Strabo makes a point of mentioning the violence of the sea in the vicinity. As the ship entered protected waters and proceeded along one of three channels (nicknamed Steganos, Posideos, and Tauros) to the docks, Eratosthenes would have seen the Lighthouse towering over him on his right, clad in marble and graced with monumental statuary, the trident of the bronze Poseidon (or Zeus or Proteus) at its peak gleaming in the sun.

Before him, the city's waterfront would have stretched in a crescent: starting from the east, where the Lochias peninsula (today, sunk below sea level) joins the mainland, he would have seen the royal compound—a sprawling complex of "various dwellings and groves" so sprawling that it "occup[ies] a fourth or even a third

part of [the city's] whole extent. For as each of the kings was desirous of adding some embellishment to the places dedicated to the public use, so, besides the buildings already existing, each of them erected a building at his own expense; hence the expression of the poet may be here applied, 'one after the other springs.'" Strabo notes that the buildings of the royal pleasure dome were "all connected with one another and with the harbor, and those also which are beyond it"—a scheme that Fraser likens to the Topkapı palace in Istanbul, but that also suggests the mazelike arrangement that Caesar would find so frustrating in his attempts to barricade himself in the palaces two hundred years later.

Below the palaces would have lain the royal anchorage, and beyond that, the small island (since vanished) that in Strabo's time boasted "a palace and a small port" and was known somewhat grandiosely as Anti-Rhodes. Behind, on higher ground, stood a splendid theater, a compulsory feature in any Greek city, and to its west, the Emporion, a complex of docks and customshouses where every ship was inspected. Farther east was the Serapeion, a vast temple complex six hundred feet long and one hundred wide, dedicated to Alexandria's patron deity. Serapis was an amalgam of Apis, the native bull god, and Osiris, the anthropomorphic lord of the dead—an instant "designer god" fashioned by the Ptolemies to give Greeks and Egyptians a deity in common.

The inspections at the Emporion had their pecuniary purpose, of course. Much of the state's revenue was derived not from direct taxation, but from duties placed on goods moving in and out of the port. But they had another mission: since the foundation of the Museum, the Ptolemies had a standing policy of confiscating any valuable books that arrived by ship in the town, copying them, and returning the copies to the owner. The originals were retained in a special section of the Great Library called "the ships' collection." In this and other ways the Ptolemies were able, in just a few decades, to amass the

largest collection of books in the Greek world. We can be sure, then, that if Eratosthenes brought any of his own books from Athens, they would have been thoroughly examined by the king's officials.

The Great Harbor was deep enough for the biggest ships to come right up to the edge of the street grid. As the passengers waited for the royal inspectors to complete their work, we can imagine that Eratosthenes was close enough to hear the bustle of the merchants' quarter, and to smell the city's fragrant treasures—the half-fruity, half-balsamic complexity of frankincense, cinnamon's sweet bite, the tang of pepper.

Cleared at least to proceed into the city, the visitor would soon encounter a spectacle of urban grandeur widely celebrated in its time. Achilles Tatius, a second-century CE native of Alexandria, included an ecstatic description in his novel, *Leucippe and Clitophon,* which should sound familiar to many a modern tourist trying to encompass the abundant wonders of Rome or Paris. It is worth quoting at length:

> As I entered through the so-called "gates of the Sun," I was immediately confronted with the brilliant beauty of the city, and my eyes were filled with pleasure. Two opposing rows of columns ran in straight lines from the gates of the Sun to the gates of the Moon. . . . Many a road crisscrossed this part: you could be a tourist at home. . . . I divided my eyes between all the streets, an insatiable spectator incapable of taking in such beauty in its entirety. There were sights I saw, sights I aimed to see, sights I ached to see, sights I could not bear to miss . . . my gaze was overpowered by what I could see before me, but dragged away by what I anticipated. As I was guiding my own tour around all these streets, lovesick with the sight of it, I said to myself wearily:
>
> "We are beaten, my eyes!"
>
> I saw two extraordinary novelties, grandeur competing with splendor and the populace striving to exceed their city. Both

> sides won: the city was bigger than a continent and the people more numerous than an entire race. When I considered the city, I could not believe that it could be filled with people; when I beheld the people, I was amazed that a city could hold them. The scales were that finely balanced.

The Arabs, who gained possession of the city by treaty in 641 CE but ultimately neglected it in favor of their own foundation at Cairo, were unnerved by Alexandria's splendor. The well-traveled Abd al-Malik Ibn Juraij offered the slightly impious encomium "if God had suffered me to stay a month in Alexandria and pray on its shores, that month would be dearer to me than the sixty [Mecca] pilgrimages which I have undertaken." Amrou ibn el-Ass, the occupying general, wrote a letter to the caliph explaining that he had "taken a city of which I can only say that it contains 4,000 palaces, 4,000 baths, 1,200 greengrocers and 40,000 Jews." The embarrassment of riches is palpable. Another Arab visitor reported, even at a late date in Alexandria's ancient career, that

> the city was all white and bright by night as well as by day. By reason of the walls and pavements of white marble the people used to wear black garments; it was the glare of the marble that made the monks wear black. So too it was painful to go out by night . . . a tailor could see to thread his needle without a lamp. No one entered without a covering over his eyes.

History does not record if Eratosthenes arrived in the city with the proper eyewear. In all likelihood, he did look toward the king's palaces, fringed with shade trees and gardens; perhaps it occurred to him that somewhere in that maze, very likely invisible from the water, were the private apartments of Ptolemy III Euergetes ("the Benefactor")—the man who had hired him as head librarian.

BENEFACTOR

Eratosthenes must have had occasion to question Egypt's reputation for stability during his first days in Alexandria. Just before he arrived, the third war between the Ptolemies and the Seleucid Empire broke out, this time over a succession dispute.

The perennial "sick man" of the Hellenistic world, the kingdom of the Seleucids had been coming apart almost since its inception. The crisis this time was occasioned by the death of the Seleucid king Antiochus II, in Asia Minor. His ex-wife, Laodice, insisted that the old king, with his dying breath, had named as successor her son Seleucus II. The sitting queen, Berenice Syra, rejected Laodice's claim and announced the ascension of her own son. She then called on her brother, Ptolemy III Euergetes, for support.

Ptolemaic kings were nothing if not devoted to their sisters. Euergetes, himself but newly crowned, rushed to Antioch at the head of a large military force. Entering his sister's private apartments, he made a grisly discovery: Berenice and her son had already been murdered by allies of Laodice.

Euergetes salvaged the situation by going on a rampage of conquest. As his army marched east, city after city surrendered before him, until by 245 he reached Babylon without encountering serious resistance. By the time the smoke cleared his rule extended deep into what is now Afghanistan; one source even asserts—dubiously—that his sway ran straight to the gates of India. Euergetes was now sovereign over a swath of territory nearly as large as Alexander's. He had to cut his victory tour short, however, when troubling news arrived from home: his Egyptian subjects were in revolt.

Proclaiming victory, Euergetes rushed back to Alexandria with a mountain of loot, including as many as twenty-five hundred Egyptian cult statues originally taken by the Persians back in the sixth century. It is likely that the rebels were emboldened by the king's

long absence in Asia. A famine caused by an inadequate Nile flood in 245 aggravated native resentment against the Greek monarchy and the burdensome cost of its imperial rivalries. In any case, Euergetes acted decisively, defeating the dissidents and importing vast amounts of grain to feed the people. According to one source, he also pivoted north in time to repulse a Seleucid counterattack against Egypt. The king's Asian empire, alas, proved even more ephemeral than Alexander's: within six months all his appointed governors were deposed, and Seleucus II was crowned in Babylon.

Fig. 3. Left: Silver tetradrachm coin depicting Ptolemy I, third century BCE

Fig. 4. Right: Gold coin depicting Ptolemy III Euergetes BRITISH MUSEUM

Considering his youth and inexperience, Euergetes survived this early crisis well. We have many likenesses of all the early Ptolemies on coins and statues (see figures 3 and 4). From his portraits, old Ptolemy I Soter appears to have been a beetle-browed, droopy-eyed fellow with a jaw thick enough to gnaw a new tip on his spear; this is clearly the battered face of a onetime grunt who had marched thousands of miles at Alexander's side. The face of his grandson, by contrast, is that of a bud-lipped aesthete.

Euergetes' baby face belied an intellect capable of heartbreaking deception. According to an account by Galen, it was Euergetes who was responsible for one of the most notorious acts of bait and switch in ancient history. After extensive negotiations, the king convinced the government of Athens to lend him what amounted to state treasures: the definitive editions of the plays of the three great dramatists: Aeschylus, Sophocles, and Euripides. To secure the loan, the Athenians demanded a deposit of fifteen talents, or approximately

nine hundred pounds of solid gold. But once in possession of the manuscripts, Euergetes simply wrote off his deposit as money well spent. Like the books confiscated from foreign ships, the originals stayed in the library, and the former owners had to be content with a handsome set of copies. Euergetes, it seems, valued the plays even more than the Athenians did.

Euergetes' self-interest had its civic benefits. One of the chronic problems of old Egypt was the calendar: based on a year of 365 days, it had the disadvantage of being about six hours shorter than the actual solar year (365.24 days). For this reason, Egyptian religious holidays had a tendency to slip backward relative to the seasons. By Euergetes' time, the situation was embarrassing—a spring planting festival, for instance, would actually take place in spring only once every 1,460 years.

The problem was well understood at the time. According to Geminos of Rhodes (c. 110–40), Eratosthenes himself treated this and similar topics in a work entitled *About the Eight-Year Cycle.* The cycle referenced in the title is a system for synchronizing the ritual and solar years by adding extra months to the calendar at intervals of two years, but not in the eighth year. As this method was clumsy, Euergetes—very possibly at the advice of his new librarian—proposed a simpler four-year cycle with three years consisting of 365 days each, plus a leap year of 366 days. This "Alexandrian" year was officially accepted by the Egyptian priesthood in 239. However, widespread local mistrust of the regime in Alexandria prevented the new calendar from being wholly implemented.

Enter Julius Caesar in 48. Faced with an old Roman calendar that was itself drifting out of sync with the solar year, he recognized the Alexandrian calendar as a worthy model for a proposed revision. His so-called Julian year retained some elements of the traditional Roman calendar (such as differing lengths for the months), but adopted the fundamentally Alexandrian features of a quadrennial

cycle and a year averaging 365.25 days. Caesar's scheme, in turn, remained the standard in the Western world for some 1,600 years, forming the basis of the Gregorian calendar we use today.

That Eratosthenes was the architect of Euergetes' proposed calendar—and indirectly of ours as well—is not a proven fact. It is only a likely possibility, given that he wrote about the problem, and that a solution promptly followed his arrival in Alexandria. It would perhaps be unfair to say that the Romans cribbed their calendar from "decadent" Egypt, but not unfair by much. It is, in any case, another reason to extol, not begrudge, the fundamental innovativeness of the Ptolemaic state.

Under Euergetes, with the return of Cyrene to Ptolemaic control by marriage, and the retention of many Aegean islands, as well as of Thrace, Coele-Syria, Lycia, and Caria in Asia Minor, and expansion of trade outposts into Arabia and as far south as modern Eritrea in Africa, the Ptolemaic Empire reached its widest geographical extent. The failed expedition to Asia, meanwhile, was spun as a reprise of the fondly remembered but equally unavailing campaigns of the eighteenth- and nineteenth-dynasty pharaohs (c. 1500–1200). This notion placed Euergetes in the unquestionably legitimate company of Thutmose I and Ramses II. The Canopus Decree of 239, in which the native priesthood resoundingly affirmed its support for his kingship, is best understood in the context of those twenty-five hundred cult statues rescued from Persia. Despite its turbulent start, Euergetes' reign—and Eratosthenes' tenure as head librarian—was on a secure footing.

THE MERMAID

There is a slogan posted in English all over modern Alexandria that reads, "Alexandria is the mermaid of the Mediterranean Sea." The metaphor is blunt, but undeniable. Like a mermaid, the city is half

fantasy, teasing us across a sea of myth. She is irresistible because we can't stop imagining the better parts she keeps hidden under the water.

I wanted to come to Alexandria as Eratosthenes had in 245. In March 2007 I was obliged to travel by plane instead of boat, because there is no longer any regular ferry service from Athens. This may be an economic inevitability in a time of discount air travel, but it is also a historical absurdity—not being able to sail into Alexandria is like not being permitted to drive into Los Angeles. The only direct flight from Greece, moreover, left in the middle of the night, and arrived at three A.M. And so, like an underworld courier delivering a bag of ill-gotten cash, the modern traveler must steal out of Athens in the dark, and slip into Alexandria when nobody is watching.

Flying in at night has one big advantage: my first glimpse of the city revealed her exactly as I had come to know her on the map. First come the scattered lights of the ships at anchor, massed at the city's doorstep like the campfires of an invading army. Then, with a thrill of recognition, I watched the curves of Alexandria's two harbors slide into view, their outlines looping like an Arabic epigram inked in incandescent gold. Though rightly known in her time as a city of lights, never in antiquity could she have shone quite like this.

But in most ways, time has not been kind to Alexandria. To appreciate what has been lost in twenty-three centuries, imagine a certain city in north-central France—and take away the Louvre, the Eiffel Tower, the Sorbonne, the Arc de Triomphe, Napoleon's Tomb, and Notre Dame. Take away the seat of national political power. Take away the intelligentsia, couture, and better restaurants (but keep the catacombs, the cemeteries, and a few broken columns from the Pantheon). Imagine that all the bridges over the Seine have been buried in silt and Île de la Cité is just a slight bump on

the landscape. What would be left might be a perfectly charming provincial city, but would it still be Paris?

None of this is meant to cast blame on Alexandria's current residents. The city has now been Arab far longer than she was Greek, yet for sheer, stupefying destructiveness, the Arabs stand near the bottom of the list of the city's victimizers. At the very top come the mobs of early Christian fanatics—the ones who fought turf battles over the Caesareum, razed the Temple of Serapis, scattered the contents of the Great Library's daughter annex, and, with the brutal gang murder of the philosopher Hypatia in 411 CE, helped to snuff out a tradition of intellectual activity that stretched back seven centuries. Also on the list are the punitive armies of Rome, the fecklessness of Byzantium, Ottoman indifference, and British gunboats. Finally, we come to the jealousy and mostly benign neglect of her masters in Cairo, to whom Alexandria and her port were, at best, redundant, and at worst, a reminder of Egypt's foreign-dominated past.

Granted, no great capital is just the sum of her institutions and monuments. As I came to know Alexandria in my brief time there, I saw that something more important—the business of life—has not disappeared from the city. Sailors still tend their wooden boats in the Great Harbor, and gangs of line-fishermen still haul their catch from the shallows offshore. The Ptolemaic avenues with their grand colonnades are gone, but the streets of Alexandria are just as crowded and chaotic as the ancient accounts describe. The draperies and veils of today's Muslim women would not have been unfamiliar to their ancient counterparts—nor the way that some of these emblems of modesty are allowed to cling to the hips, complemented by fancy heeled shoes, or made moot by furtive glances. That Alexandria has survived at all represents a significant victory, given that the city, with a population of perhaps half a million in Cleopatra's time, was reduced to just four thousand souls in Napoleon's, clinging to just a fraction of its original area.

When I told people at home that I was traveling to Egypt in the spring of 2007, a few were intrigued, but most were concerned. "Travel safe," my agent wrote; asked others, "Aren't you afraid?" I had visited Cairo and Upper Egypt in 2000, and had some experience traveling in other parts of the Middle East, so I knew that the chances of suffering from crime were worse in almost any U.S. city, and that anti-American bias was more likely to be encountered in Athens than in Alexandria.

But the Alexandrines outdid even my rosy expectations of hospitality and courtesy. Walking down the street, the typical American with his sunglasses, bridal-white tennis shoes, and hopeful cluelessness is about as obvious as a stray giraffe. Yet the spectacle draws almost incomprehensible good will—"Welcome to Egypt!" and "Welcome to Alex!" come from all sides. Catch anyone's eye and you'll get a smile; stare into a crowded minibus and every passenger will wave. Learn a few words of Arabic and you're the Tadeusz Kościuszko of foreigners, perhaps worthy of enshrinement on the Corniche.

Perhaps this is all for show, and doesn't reflect what the average Egyptian really thinks of Americans. A useful rule of thumb in this regard is to forget the adults and pay attention to the behavior of the children. Below a certain age, kids don't have enough guile to filter what their parents tell them in private. From them, you get a peek into what's in the hearts of the grown-ups, buried under all the emotions and rationalizations that come with adult concerns.

Heading to Fort Qaitbey on my first morning in Alexandria, to the site of the legendary Pharos, I encountered scores of children out on school field trips. Most of them thought my presence was a good opportunity to try out their one or two English phrases: *What is your name?* and *Where are you from?* are the favorites. Before long I was signing autographs, posing for pictures, and being told how hand-

some I was by the more forward—yet somehow still outwardly discreet—young women. This, it appears, is what it's like to lead K-Fed's charmed life; for one brief hour, I could have been Marc Antony, Cleopatra's Roman lover, or that other Marc Anthony, the one attached to Jennifer Lopez.

PTOLEMYLAND

The point of my visit, though, was to see what I could see of Alexandria's grand past. Thanks to an ongoing program of salvage archaeology in the Great Harbor, such remnants are now easier than ever to find. Fragments of pink Aswan granite from the Pharos are built into the reconstructed Fort Qaitbey, which stands on the site of the original lighthouse. Monumental statuary that once graced the Pharos precinct has been raised from the harbor floor and set up in various places in the city, such as the fragments near the little Roman theater at Kom al-Dikkah, and the colossal figure of Ptolemy II erected outside the modern Biblioteca Alexandrina in the old palace district (see figure 5). All of the salvaged figures were scoured by the swirling currents near the harbor mouth for centuries, and therefore have the smoothed-over, hollow-eyed look of creatures snatched, to their surprise, from the grip of oblivion. But they do give us a sense of the hardware that greeted visitors sailing in under the shadow of the Lighthouse. In his time, Pompey passed these statues on the way to his betrayal; Caesar, pursuing his rival, gazed at these faces too, and probably pondered the quality of the monarchs they represented.

Fig. 5. Ancient monolithic statue of a Ptolemic ruler, salvaged from the harbor floor near the site of the Pharos. The colossus now stands in front of the new Biblioteca Alexandrina.

And what of the city's old topography? General subsidence of the waterfront, combined with a rise in elevation inland, have erased the city's original outlines. The broad sweep of the harbors remains, but the quays where Eratosthenes landed are now underwater. Today, where the treasure of continents once passed, divers and snorkelers swim the trash-strewn shallows in search of artifacts, and wrecks of fishing boats nod and rot in the gentle surf.

Likewise obscured is the city's legendary wealth. Augustus boasted that he found Rome a city of brick and left it one of marble; in Alexandria, history has taken a city of marble and left it one of tin, plaster, and tar paper. Disheveled piles surge toward the sea, shouldering each other for a place on the shore. A fine mist of pulverized concrete seems to cover everything, and the once salubrious climate is overwhelmed by smog. For some reason, I arrived when all the sidewalks had been pulled up, rendering the only refuge from the city's murderous traffic a shambling crater-scape. It's untidy, but at least it is genuinely so—thankfully, the twee, sanitized historic districts ("Ptolemyland") we mistake for downtowns in the West have not yet made it to Egypt.

Primary thoroughfares have a way of persisting through the indignities of time—though Manhattan Island has been entirely resurfaced by human hands, the old Indian trail through it persists as Broadway. Tradition has it that modern Sharia Nabi Danyal corresponds to the Street of the Soma, ancient Alexandria's primary north–south byway. It stands to reason, then, that somewhere along that street should be a spot corresponding to the ancient city's main crossing, the confluence of the Street of the Soma and the east–west-running Canopic Way.

Heading into Africa from my harborside hotel, I entered a warren of narrow streets throbbing with activity. Instead of the franchised blandness of American cities, Alexandria is a city of mom-and-pop stores, all with signage screaming for attention, their

wares encroaching on the streets. Fiat taxis run the gauntlet, honking promiscuously above Arabic monologs droning from speakers. Men watch from lawn chairs or stand, hands balled in their pockets. The heads of the women are almost universally covered, with a few completely draped, peering through their slitted abayas or utterly invisible under closed hoods. One wants to respect cultural differences, but the effect here is dismaying—the city that gave us Cleopatra now obliges women to hide their faces.

Reaching the train station, I realized I had gone too far. I doubled back toward the bookstalls, puzzled by the disparity between the map and what I saw. The mosque that was supposed to be on the site of Alexander's tomb, the Masgid al-Nabi Danyal, should be on the east side of the street. After a few trips back and forth, I realized my mistake: the mosque was there all the time, but I had walked right past it.

Masgid al-Nabi Danyal is a low, modern, meringue-colored structure, set four shallow steps above street level and far back in a courtyard. It is easy to overlook, lying as it does in the shadow of a neighboring high-rise, which was then only a frame of reinforced concrete. To look at it, it's hard to believe this unobtrusive structure may lie above the storied final resting place of Alexander the Great (and, perhaps, the biblical prophet Daniel as well). Kings and commoners alike made pilgrimages to this spot to gaze at the conqueror's unspoiled remains in their golden sarcophagus. Caesar prayed there, and as Augustus bent to kiss the great man's face, he accidentally broke the corpse's nose. Today, the setting is dwarfed by a cellular transmission tower.

The spot corresponding to the famous crossroads lies just a few yards north of the mosque. Since it was known as the Canopic Way, the city's main east–west artery has been renamed many times—a century ago, E. M. Forster complained that the previous name, the Rue de la Porte Rosette, was being changed to "the unmeaning Rue Fouad Premier, thus breaking one of the few links that bound

[the] city to the past." Though many of the locals still call it Fouad Street, it is now known variously as Tariq Abd el-Nasser, Tariq al-Hurriyyah, and Ishak Nadim Street. Whatever you call it, the street is still as arrow straight as it was twenty-three hundred years ago, when it ran between the Gate of the Sun in the east and the Gate of the Moon in the west. Today is it a speedway for black-and-yellow taxis taking advantage of limited pedestrian access. One can only imagine the speeds the drivers could have reached on the original Canopic Way, which was at least twice as wide as the existing thoroughfare.

There's a buff-colored neoclassical structure on the northwest corner of the intersection. Though the grand colonnade Achilles Tatius described is gone (see pages 10–11), the modern building has a few Ionic columns standing on massive volutes. Fetching my camera, I snapped a picture of what I took to be the last columns to stand on the old Canopic Way.

THE WORLD RECKONER

The world known to the ancient Greeks was a tiny place. Geographical knowledge in the classical period of fifth to fourth centuries BCE—the times of Socrates, Plato, Pericles, Sophocles, and Aristotle—was not much broader than in Homer's day, four hundred years earlier. All told, the Greeks knew the Mediterranean Sea from Gibraltar to Syria; they knew that the European continent stretched north into an icy waste, and that Africa stretched south into a trackless, infernal desert. Of Asia they appreciated the vast extent of the Persian Empire, and they had an inkling of the Indian subcontinent beyond. But of the rest of the Old World, including central and southern Africa beyond Nubia, the northern half of Europe, and all of central and east Asia, they knew little or nothing (see figure 6).

Fig. 6. The world known to the Greek historian Herodotus, fifth century BCE

The conquests of Alexander in the late fourth century gave the Greeks firsthand experience of Persia, India, and the Asian kingdoms lying between. The voyage of Nearchus, who was commissioned by Alexander in 325 to reconnoiter a possible sea route for the invasion of Africa, taught the Greeks much about the coastal regions of the Arabian Sea and the Persian Gulf. Around 300, an explorer named Pytheas sailed a ship through the Straits of Gibraltar, turned north, and circumnavigated the British Isles. He referred to other lands beyond, but scholars continue to dispute which places (Iceland? Norway? Denmark?) correspond to his descriptions.

Herodotus recounts an earlier voyage that surpassed Nearchus and Pytheas in audacity: around 600, a Phoenician fleet hired by Pharaoh Necho actually circumnavigated the African continent. The voyage supposedly took three years, with frequent stops in the foul-sailing season to build temporary settlements and sow crops for the next year's push.

Herodotus, who is not exactly renowned for his skepticism, relates the story but discounts it—he can't accept the idea that the Phoenicians sailed so far south that the sun rose and set in the northern half of the sky. But for us this is just the sort of key detail that makes the story convincing. Necho's expedition probably did happen, but Herodotus's guardedness suggests it added little to the store of Greek geographical knowledge. Most authorities, including Aristotle (384–322), continued to believe that India was somehow connected with Africa, rendering such a circumnavigation of the latter impossible from the Red Sea. The margins of the Greek world continued to remain dark, narrow, and filled with sea monsters, giant gold-digging ants, and men with faces in the middle of their chests.

It was not long after this that a certain Greek polymath named Eratosthenes of Cyrene (c. 285–204 BCE) calculated the circumference of our planet. Indeed, he did so accurately, coming at least to within 10 percent of the modern polar measurement of about 24,860 miles, and perhaps as close as 1 percent. He accomplished this without the complex surveying equipment available later to the Romans, let alone GPS receivers, laser range finders, or satellites. He did it, in fact, with nothing more than a sundial, a compass, and a scrap of paper (or, more likely, a scrap of papyrus) to make a simple calculation.

The Roman naturalist Pliny the Elder (23–79 CE) praised Eratosthenes as "a man who was peculiarly well skilled in all the more subtle parts of learning, and in this above everything else, and a person whom I perceive to be approved by everyone." He further declared that Eratosthenes' earth measurement was "supported by such subtle arguments that we cannot refuse our assent." Indeed, it was one of the greatest feats of practical geometric inference in history. Fortunately, it was also widely known in antiquity—we know about it in detail because one of Eratosthenes' successors, an otherwise obscure mathematician named Cleomedes, left a

lengthy description (Eratosthenes' own treatise, *On the Measurement of the Earth,* has been lost.)

As we shall see, his work continued to have repercussions down to the eve of the Renaissance, as Columbus prepared to sail west to China. Geography didn't catch up to Eratosthenes until true ocean-going ships proved his calculations directly, almost two thousand years after he was born. To say what he found was "ahead of its time" would therefore be a squalid understatement. His experiment belonged to a different world entirely—a world light-years ahead of the floating disks and squat cylinders previous ancient authorities had imagined our planet to be.

GEODESY

There is virtually no math in this book. However, to put Eratosthenes' geodesy (a fancy word for "earth measurement") in context, it is essential to understand what went into his calculations.

Eratosthenes was a foreigner in Egypt, appointed as only the third head librarian since the founding of the Museum in Alexandria. The latter was an unprecedented institution in the Greek world—a place devoted not only to the religious cult of the Muses, but to advancing human knowledge in the broadest sense. The foundation, purpose, and organization of the Museum (and the associated Great Library) will be discussed in some depth below. What is most relevant here is that when Eratosthenes arrived in Egypt he must have heard a curious fact: somewhere near Syene (modern Aswan), there existed an open well into which the sun shone directly to its bottom but once a year—at noon on the summer solstice, when the sun was highest in the sky in the northern hemisphere.

The importance of this fact can be understood by looking at Box 1 on page 27 (geometriphobes should feel free to skip the details).

Eratosthenes' limpid inference does conceal a few additional assumptions, and some difficulties. It assumes that the well in Syene was sunk perpendicularly to the surface of the earth. It posits that Syene lies at the latitude where the sun is overhead on the summer solstice (that is, at the Tropic of Cancer), and that Syene and Alexandria lie on the same line of longitude, both of which suppositions are only approximately true. More crucially, it assumes that the earth is a sphere and that the sun's rays strike it in parallel lines—assumptions that seem safe today, but as we shall see below, were far from settled issues in Eratosthenes' time.

As for the difficulties, even this apparently simple procedure taxed the primitive measuring technologies of the period. Measuring angles amounted to eyeballing shadows on a compass, which might do for gross approximation but could not yield very accurate results. Fixing accurate distances between cities was a difficult proposition before the advent of modern surveying techniques. More often than not, such distances were expressed merely as approximations based on traveling speeds—that is, if it took a caravan ten days to reach its destination at one hundred stades a day, the distance must be one thousand stades. (As we shall see, Eratosthenes probably had a more firm basis for the distance he used between Syene and Alexandria.)

The most pedantic difficulty—and the one that has undoubtedly spilled the most scholarly ink—is the question of which version of the stade Eratosthenes used in his work. In the days before international standardization of such units, there were several candidates. There was a short stade, equivalent to one-fortieth of an Egyptian schoenus, three hundred royal cubits, or 157.2 meters; there was a somewhat longer Attic stade of 177.6 meters, and a so-called long stade of 185 meters. The figure of 252,000 Egyptian "short" stades is closest to the true circumference of the earth; even the Attic stade would have gotten Eratosthenes within 15 percent

BOX 1: ERATOSTHENES' GEODESY

The essential principle behind Eratosthenes' reasoning can be understood by anyone with an elementary knowledge of geometry. On the scale of difficulty seen in the math section of a typical college entrance exam, the problem probably would rank around the middle. But like many innovations, the solution is remarkable not for its inherent difficulty, but because it took one remarkable mind to apprehend its power.

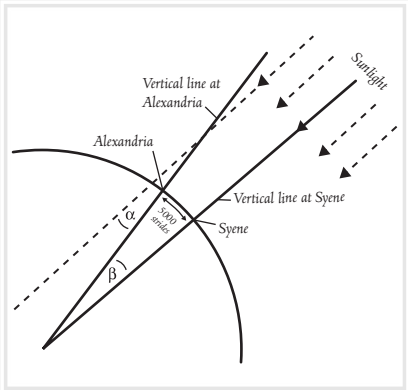

Fig. 7

If the sun is directly overhead at Syene on the solstice, then the simultaneous angle of the sun's shadow back at Alexandria, α, must by definition be the same as the angle β between two lines drawn from the earth's center to Syene and Alexandria. If angle β is known, and we know that the complete circumference of a circle contains 360 degrees (a convention borrowed by the Greeks from the Babylonians), then we can set up a simple proportion:

$$\frac{\textit{angle } \beta}{360} = \frac{\textit{Linear distance from Syene to Alexandria}}{\textit{Circumference of the earth}}$$

Eratosthenes took the distance from Syene to Alexandria to be 5,040 stades (a *stade* was an ancient unit of measure approximately equal to 600 modern feet). Using some vertically plumb object

continued …

at Alexandria on the day of the solstice, he measured angle α, and therefore angle β, at 7.2 degrees. Knowing three of the terms in the equation above, he was then in a position to calculate the final term, the circumference of the earth. His final result, 252,000 stades, works out to 24,662.2 miles—just under 1 percent shy of the modern polar measurement of about 24,859.8 miles.

of the true measurement. In any case, as we shall see below, there is good reason to think Eratosthenes used the Egyptian unit.

In the rest of this book we will explore these assumptions and difficulties. In some cases, we will find that Eratosthenes was prescient in his thinking; in others, that he was sloppy or mistaken, but that his errors had the fortuitous effect of canceling each other out. We will try to understand his choices by looking carefully at what is known about him and his world—his birthplace, his adoptive homes in Athens and Alexandria, his predecessors, colleagues, and enemies. Occasionally, we will not shy away from using some narrative imagination in reconstructing this background, both because little has come down to us about Eratosthenes himself, and because the truth is not always reducible to the literal facts. In this way, it will become clear that even the most transformative, elegant-seeming solution, appearing by inspiration two thousand years before its time, was the result of a struggle.