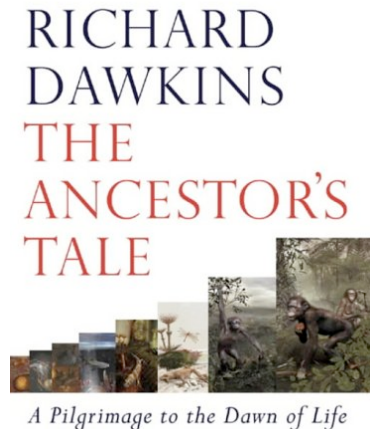


Greeting the Concestors

A Pilgrimage to Celebrate the Bonds of Kinship with All Life

Ritual components by Connie Barlow
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ADAPTED FROM THE 2004 BOOK
BY RICHARD DAWKINS:

ANCESTOR'S TALE

What a gift Richard Dawkins has given us! He has sifted through the vast discoveries of biologists and paleontologists to reconstruct the lineages of life for a uniquely wonderful purpose:

To celebrate the relatively small number of ancestors *that we share with other living species.*

His book takes us on a **pilgrimage** in which we are each initiated into serving as on **ambassador of our human species** during the journey back through time, backwards through the evolution of life. At each juncture when an ambassador from another living species joins ours, we take notice: for this is an ancestor that we hold in common: a **concestor**.

For example, we human ambassadors journey backward, through some 250,000 generations of ancestors, to a time perhaps 6 million years ago, when we meet **Concestor #1: the shared ancestor of humans and chimps**. (Hominid ancestors are not greeted along the way for the simple reason that there are no other species of hominids alive today.) We continue meeting ape concestors (gorillas, orang utans, and gibbons), and then at **Concestor #5**, 25 million years ago, we meet a concestor who for the first time sports a **tail!** The monkeys have joined us.

Amazingly, **only 40 such rendezvous with other pilgrims will carry us to the very origin of life!**

How is this possible? Consider: All species of conifer trees and flowering plants and ferns and mosses and algae will have met up with one another, sharing their own plant concestors, before the swarm of plant pilgrims as a whole meets our swarm of

animal pilgrims on this journey through time. The two swarms greet **our shared ancestor of plants and animals at Concestor #36.**

I (Connie Barlow) have done the work to extract the basic information from Dawkins' book, in order to present short and simple guidance that can be used to **enact the ritual journey.** That guidance appears in the multiple pages that follows, listed for each of the 40 concestors. But first, here are some suggestions for how to turn this information into a rich and memorable ritual.

Guidance for Enacting "Greeting the Concestors" Ritual

1. NUMBER OF PARTICIPANTS. Determine whether you have enough ritual participants to distribute all 40 Concestor parts individually, or whether you need to group some concestors together to accommodate fewer participants. For example, you might wish to group together:

- Concestors 5 & 6 (Old World and New World monkeys)
- Concestors 10 through 13 (all other placental mammals)
- ... and so on.

If the group is larger than 40, people can group together to represent a concestor. Or some people may choose to simply take the whole journey as human ambassadors.

2. PRINT and cut apart the 40 concestor parts. Determine how each part will be distributed or chosen. An option that honors people's differences in how "primitive" they would like to be, or how much time they like to spend alone (if the event takes place as a linear walk outdoors) would place the parts face down on the floor, from Concestor 1 to 40. Then simply tell participants the parts are in order and thus offer suggestions for what it means to pick from earlier or later parts of the concestor lineage.

3. FORMAT: INDOOR? OUTDOOR? Determine the format for the pilgrimage. Will you all take the pilgrimage while seated in a room, asking each concestor to rise and speak in turn? Or will you assign each concestor to a particular station along an outdoor trail, so that the pilgrimage takes the form of an actual walk through time. For the latter, you could use bright survey tape marked with a number for each concestor to direct each person to their "spot," asking them to, of course, remove the survey tape once they take their station and thus to surprise the pilgrims by simply popping out of the landscape at them.

4. COSTUMES, FACE PAINT. Determine how to introduce this program, and what sort of time and materials might be available to allow each participant to construct any costume, mask, or face paint they may wish.

5. CREATING WHAT TO SAY. Encourage each concestor representative to imaginatively use the information provided to them to make their statement when they appear, using the "I" form — that is, acting in character. It would be ideal if

you have an opportunity to distribute the concestor parts to participants hours or even a day in advance.

6. INSTRUCTING JOINED PILGRIMS ON A GREETING REFRAIN. To ritualize the endeavor, consider asking individuals to stay in character (wordless, obviously) after they have joined the growing mass of pilgrims. It may be nice, however, to establish *in advance* a ritualized greeting for each concestor. That is, when the concestor has finished speaking/acting, the concestor would say something like, "And so I have spoken." At which point, the amassed pilgrims might reply, "We greet you, Concestor. Please join us on our journey through time." Or you might want to invent a short little song or chant to use at such junctures.

7. BEGINNING THE RITUAL. It is important to create the ritual departure, when the participants are to become their concestors and the journey is to begin. Choose a reading, a song, a chime, a silence, or some signal that the ritual is beginning. Here is a possible reading, from the acclaimed essay "Starthrower", by Loren Eiseley, in his 1969 book, *Unexpected Universe*.

"We are rag dolls made out of many ages and skins, changelings who have slept in wood nests, and hissed in the uncouth guise of waddling amphibians. We have played such roles for infinitely longer ages than we have been human."

8. ENDING THE RITUAL. If the ritual is performed indoors, then everyone will be able to witness all meetings with the concestors. But if the ritual is enacted outdoors along a trail, then participants who enact the later concestors will have the joy of "performing" their part before a large group of pilgrims, but they will have missed learning and participating in the journey of the previous concestors. There are several ways to solve this problem:

Option 1: Design the physical route as a circle or a spiral so that later concestors have a chance to hear earlier concestor greetings. (Suggestion by Ruth Rosenhek)

Option 2: Give participants a choice as to whether they take their spots at the outset, or whether they begin the pilgrimage as humans, choosing a time to sneak off into the landscape or dart ahead to get to their own spot and have time to put on whatever (if any) costume they have made.

9. COUNCIL OF ALL CONCESTORS AT END? If there is time, a wonderful way to conclude the pilgrimage would be to gather in council, as "A Council of All Concestors." See John Seed's webpage on Councils of All Beings for ideas and guidance:

<http://www.rainforestinfo.org.au/deep-eco/cabcont.htm>

So, ritual leader(s): Use your imagination, and talk with others to prepare this ritual. And create the ritual space for the participants to flow with joy and abandon into their respective roles. And do let me know what innovations you use that seem to work well — so that I can post them on this website for others to benefit from.

Together in the Great Work!
Connie Barlow
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The 40 Concestors

- (1) chimpanzees;
- (2) gorilla;
- (3) orang utan;
- (4) gibbons;
- (5) Old World monkeys;
- (6) New World monkeys;
- (7) tarsiers;
- (8) lemurs;
- (9) tree shrews;
- (10) rodents & rabbits;
- (11) Laurasiathere mammals;
- (12) Xenarthran mammals;
- (13) Afrothere mammals;
- (14) Marsupial mammals;
- (15) Monotreme mammals;
- (16) reptiles & birds;
- (17) amphibian;
- (18) lungfish;
- (19) coelacanth;
- (20) ray-finned fishes;
- (21) sharks;
- (22) lampreys & hagfish;
- (23) lancelets;
- (24) sea squirts;
- (25) starfish;
- (26) mollusks, worms, crustaceans, insects & spiders;
- (27) primitive flatworms;
- (28) jellyfish;
- (29) comb jellies;
- (30) placozoans;
- (31) sponges;
- (32) single-cell eukaryotes;
- (33) drips;
- (34) fungus;
- (35) amoebozoan;
- (36) plants & algae;
- (37) Giardia, diatoms, forams, & brown algae;
- (38) Archaea;
- (39) Eubacteria;
- (40) Origin of Life

#1 Rendezvous: Greet your CHIMPANZEE cousins!

TIME: 6 million years ago, during the late part of the Miocene epoch of our Cenozoic Era.

WHERE: a forest clearing in Africa

WHO JOINS? Chimpanzees and Bonobos (pygmy chimps), which are the 2 living species of genus *Pan*.

CONCESTOR 1 is your 250 thousandths great-grandparent.

FORM: This concestor looks more like a chimp than a human; it probably makes and uses tools. Although we spend a lot of time on the ground, we **feel safest in trees** and certainly sleep there.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 3

#2 Rendezvous: Greet your GORILLA cousins!

TIME: 7 million years ago, during the Miocene epoch of the Cenozoic Era. This is only a million years earlier than our rendezvous with chimpanzees.

WHERE: a forest in Africa

WHO JOINS? Gorillas (2 species of genus *Gorilla* are alive today).

CONCESTOR 2 is your 300 thousandths great-grandparent.

FORM: Concestor 1 walks on its knuckles, but **trees are still home**, and will continue to be for 7 more concestors. Like our previous concestor, and the next 7, this one sleeps in trees.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 5

#3 Rendezvous: Greet your ORANG UTAN cousins!

TIME: 14 million years ago, during the middle of the Miocene epoch of the Cenozoic Era.

WHERE: a forest, probably in Asia

WHO JOINS? Orang utans (2 species of genus *Pongo* are alive in Asia today.

CONCESTOR 3 is your 750 thousandths great-grandparent.

FORM: This concestor was surely even more at home in **trees** than our previous concestor, but we don't know if our shared concestor was quite as arboreal as modern orang utans.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 7

#4 Rendezvous: Greet your GIBBON cousins!

TIME: 18 million years ago, during the early Miocene epoch of the Cenozoic Era. This time is called "**the Golden Age of Apes**" because so many different kinds of apes are thriving.

WHERE: a forest, probably in Asia

WHO JOINS? Gibbons (12 species of living gibbons, in 4 distinct genera).

CONCESTOR 4 is your 1 millionth great-grandparent.

FORM: Gibbons are the finest arboreal acrobats that have ever lived, but it is thought that direct human ancestors were never that talented in trees, so this concestor lives in trees but is not as acrobatic as modern gibbons. This is our **last APE concestor**.

TOTAL # SPECIES ON THE PILGRIMAGE NOW: 19

#5 Rendezvous: Greet the OLD WORLD MONKEYS!

TIME: 25 million years ago, during the Oligocene epoch of our Cenozoic Era.

WHERE: we are now back in Africa, and in a forest

WHO JOINS? Old World Monkeys — nearly 100 species of colobus and langur monkeys and baboons.

CONCESTOR 5 is your 1.5 millionth great-grandparent.

FORM: Look behind you: You now have a **tail** for the first time!

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 118

#6 Rendezvous: Greet the NEW WORLD MONKEYS!

TIME: 40 million years ago, during the Eocene epoch of our Cenozoic Era.

WHERE: this happened in Africa, but since “New World Monkeys” are all in the western hemisphere, somehow they “island hopped” or “rafted” on fallen trees over to South America.

WHO JOINS? New World Monkeys, including some (like howler monkeys and spider monkeys) with “prehensile tails” — tails that can wrap around tree branches. About 100 species are alive today.

CONCESTOR 6 is your 3 millionth great-grandparent.

FORM: Say goodbye to PMS! This far back in the primates, we **lose female menstruation**.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 220

#7 Rendezvous: Greet your TARSIER cousins!

TIME: 58 million years ago, during the Paleocene epoch of our Cenozoic Era.

WHERE: This is possibly **the first rendezvous that takes place in North America!** In a dense forest.

WHO JOINS? Tarsiers. There are 5 species of living Tarsier, tiny nocturnal primates with huge eyes. They are not monkeys, but they are still primates.

CONCESTOR 6 is your 6 millionth great-grandparent.

FORM: Even though the tarsiers are nocturnal, the common ancestor we share with them probably was active during the day, so this concestor still has color vision, as did all our previous concestors.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 225

#8 Rendezvous: Greet your LEMUR cousins!

TIME: 63 million years ago, during the Paleocene epoch, which is the earliest part of our Cenozoic Era.

WHERE: There is no sound evidence as to where this took place, but certainly in a forest as we are all tree dwellers still.

WHO JOINS? Lemurs of Madagascar, Bushbabies of Africa, and Lorises of Asia. About 50 total species.

CONCESTOR 8 is your 7 millionth great-grandparent.

FORM: We are all still tree-dwelling primates. Let us pause for a moment to be thankful that Madagascar separated from Africa (the separation began 165 million years ago). Somehow lemurs rafted to Madagascar, but by the time that monkeys evolved, the island was too far away for monkeys to get there. Had monkeys arrived in Madagascar, this only remaining refuge for lemurs would have been lost. Earth history reveals that wherever and whenever monkeys entered a landscape, the lemurs vanished. Islands are thus wondrous havens for biodiversity, because competition with other species is less intense on islands. **Praise for islands!**

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 275

#9 Rendezvous: Greet your TREE SHREW cousins!

TIME: 70 million years ago, during the Cretaceous Period. That means there are big, scary **dinosaurs** in our neighborhood now! From now on, all of our mammal ancestors will be wise to **stay small and out of sight** of the big dinosaurs. We say goodbye to the Cenozoic Era because we are now in the Mesozoic Era.

WHERE: We have no idea, but all species alive in the modern world are found only in Southeast Asia, and since they all live in trees, this rendezvous had to have happened in a forest. Because the Cretaceous was much warmer than world climate today, "tropical" climates were found in many parts of the world.

WHO JOINS? There are 18 species of Tree Shrew alive today, so 18 new ambassadors join us. Plus there are 2 other species who join that are called Colugos. Colugos are also known as "flying lemurs", but they are not lemurs.

CONCESTOR 9 is your 10 millionth great-grandparent.

FORM: **We're not sure whether we are still primates.** The colugos (also known as "flying lemurs" are adept gliders, with bat-like wings. The tree shrews look kind of like mice, which in fact will be the folks that we greet at our very next rendezvous.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 295

#10 Rendezvous: Greet the RODENTS and RABBITS!

TIME: 75 million years ago, during the Cretaceous Period of the Mesozoic Era.

WHERE: unknown, but surely in the company of many dinosaurs prowling our neighborhood.

WHO JOINS? All 2000 species of living rodents — mice, rats, beavers, porcupines, squirrels, gophers, hamsters, guinea pigs, capybaras. Plus all 70 species of living rabbits and hares, which are distinct from rodents.

CONCESTOR 10 is your 15 millionth great-grandparent.

FORM: **We look like a mouse or small rat now!** And we are almost surely nocturnal, so **say goodbye to color vision.** We don't know whether this ancestor lived in the trees or **burrowed** in holes in the ground, though. And reflect on this: we humans are more closely related to mice and rabbits than we are to dogs and deer and whales — all of whom will be joining at our very next meeting point.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Wow! Our ranks have swollen from about 300 at our last rendezvous with the Tree Shrews to around 2,400 now!

#11 Rendezvous: Greet the LAURASIATHERES!

TIME: 85 million years ago, still during the Cretaceous Period of the Mesozoic Era.

WHERE: This rendezvous takes place somewhere in the Northern Hemisphere, on the **ancient supercontinent called "Laurasia"**, which was a combination of the Laurentian Shield of Canada (which would later become North America) and what we now call Eurasia.

WHO JOINS? An **amazingly diverse group of mammals**: cats, dogs, and bears (Carnivores), horses, rhinos, tapirs, cattle, sheep, goats, deer, caribou, antelope, hippos, camels, pigs, hedgehogs, true bats, fruit bats, and shrews. And hauling up out of the ocean to join our pilgrimage now are **whales** and dolphins and seals and walruses! All told there are about 2,000 species of Laurasiatheres, grouped into 8 distinct taxonomic orders of living mammals.

CONCESTOR 11 is your 25 millionth great-grandparent.

FORM: This ancestor truly looks like a **rat or shrew**, as do all the mammal ancestors during the time that we co-existed with dinosaurs. It just so happened that after the dinosaurs were killed off by a meteor impact, some of those ancient rat-like mammals turned into primates; some turned into rodents; and some turned into everything else! So the most exciting part of this rendezvous is not so much to look at our shared rat-like ancestor but at **the huge diversity of mammal forms that join us** in our shared pilgrimage!

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 4,500

#12 Rendezvous: Greet the XENARTHANS! (zee-NAR-thrans)

TIME: 95 million years ago, still during the Cretaceous Period of the Mesozoic Era.

WHERE: Perhaps this happened in **South America**, as all the Xenarthran pilgrims who join us, and all the xenarthrans who ever lived, originated in South America, which split away from its connection with Africa about 200 million years ago. In fact, no Xenarthran lived anywhere except South America until just 3 million years ago, when the Isthmus of Panama rose and thus connected South America with North America (which is why there are armadillos in North America today).

WHO JOINS? Who are the Xenarthrans? The living xenarthrans include a total of just 30 living species of three kinds of critter: **tree sloths, armadillos, and anteaters.**

CONCESTOR 12 is your 35 millionth great-grandparent.

FORM: All Xenarthrans share a peculiar way of having each **vertebra** hook onto the next in their backs, but the ancestor we share with them probably didn't. Again, that ancestor still looks like another shrew, so don't bother too much with trying to envision the shared ancestor. Rather, say hello to the strange mammal forms of **sloth, armadillo, and anteater** that now just us!

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 4,530

#13 Rendezvous: Greet the AFROTHERES!

TIME: 105 million years ago, still during the Cretaceous Period of the Mesozoic Era.

WHERE: this may have happened in **Africa**, as all of the living mammals who join us at this stage of our shared pilgrimage evolved into their recognizably distinct forms in Africa.

WHO JOINS? **Aardvarks** and **hyraxes** and **golden moles** join us in Africa. Also, the **tenrecs** that are now confined to Madagascar join too. So do the **elephants**. And hauling out of the ocean are close cousins of elephants: **manatees** and **dugongs**. A total of 70 living species of these diverse Afrotheres now join in.

CONCESTOR 13 is your 45 millionth great-grandparent.

FORM: Yes, this ancestor still looks like a rat, but what makes this joining significant is that for the first time **we have finally greeted every single representative of placental mammals alive today**. We greet a whole different kind of mammal at our next rendezvous.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 4,600 And all of them are placental mammals; the fetuses grow within their mother's womb, nourished by a fleshy, blood-rich case that separates them from the blood of the mother: a placenta.

#14 Rendezvous: Greet the MARSUPIAL MAMMALS!

TIME: 140 million years ago, during the early Cretaceous Period of the Mesozoic Era.

WHERE: Even though all the marsupial mammals alive today (272 species) are known to have originated in the southern hemisphere, the common ancestor of placental and marsupial mammals is thought to have lived in the north. Marsupial mammals (which give birth to fetuses, who then further develop in an external pouch of the mother) once were found on all continents, but **living ones are now found only in South America and Australia** (except for 1 species of possum that recently migrated into North America). Gondwana is just starting to break apart.

WHO JOINS? Almost all the kinds of marsupials alive today are found inside Australia or New Guinea. The sole exception are the opossums, of which all but one live in South America (1 species in North America). All the other marsupials take the form of **kangaroos, bandicoots, wombats, koalas, and Tasmanian devils**.

CONCESTOR 14 is your 80 millionth great-grandparent.

FORM: Again, don't bother to scrutinize our common ancestor at this rendezvous, as it still looks like a rat. But consider that a Tasmanian devil that looks like a wolverine is more closely related to a possum or a kangaroo. This is called **evolutionary convergence**.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: about 4,900

#15 Rendezvous: Greet the MONOTREME MAMMALS!

TIME: 180 million years ago. This is our **first rendezvous in the Jurassic Period**. Our common ancestor at this time shared the world with the great **long-neck dinosaurs!**

WHERE: Wow! This is our **first encounter with the supercontinent of Pangaea**. All the continents of the world are still together, although those of the north (what will become Laurasia) and the south (what will become Gondwana) are just connect by a little bit. So this common ancestor could have lived anywhere. Monotremes probably evolved in the Gondwana area.

WHO JOINS? Australia's **Duck-Billed Platypus** and 2 genera of **Echidna** join our pilgrimage, for a total of just 5 new species.

CONCESTOR 15 is your 120 millionth great-grandparent.

FORM: Wow! Instead of being born, **we are now hatched**, and so like all reptiles we are born with an egg tooth! This is because all the monotremes **lay eggs**. What makes us mammals is that we still have mammary glands; mothers still provide milk for their "hatched" young. In the monotremes, however, the nipple is lost; milk is instead exuded (from modified sweat glands) and lapped up by the baby. We have also become a lot like birds and reptiles at this stage in our ancestry, because instead of having one hole for pooping and a separate hole for peeing, in monotremes everything (including the eggs) come out of a single hole, called a **cloaca**. Living birds and reptiles all have cloacas, and so did our Concestor #15.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW, which means all living species of mammals: still about 4,900 species

#16 Rendezvous: Greet the Reptiles & Birds!

TIME: We make a huge jump back in time from the Jurassic of the Mesozoic Era way back into the **late Carboniferous Period** of the Paleozoic Era. This is 310 million years ago. So we have skipped over 130 million years. Wow! We have lots of ancestors during that 130 million year gap, of course; but we have no **concestors** — that is, we have no ancestors shared with another group of living animals.

WHERE: There were no continents as we now know them, and this was before the great supercontinent of Pangaea came together. So the “Where?” question doesn’t make much sense even to ask.

WHO JOINS? All 9,600 species of living **birds** and 7,770 species of living reptiles — that means **lizards, snakes, crocodiles, and turtles**. If we wish, we could invite an honorary representative of the dinosaurs to join us, but it would have to be a ghost dinosaur, because we are only gathering ambassadors of LIVING species on this pilgrimage. Which ghost dinosaur would you choose to come join us?

CONCESTOR 16 is your 170 millionth great-grandparent.

FORM: We already started laying eggs at our last rendezvous with the Monotreme mammals, so the big change now is that we **stop providing milk for our young**. And **our fur morphs** into either feathers or scales. We also **lose the ability to heat up our bodily temperatures**, and thus we, like the reptiles go dormant on cold nights and if we happen to be located someplace that is seasonally cold. We also **lose our palates** (the upper part of the inside of our mouths), which means that there is no separation between the breath coming in through our nostrils and the mash of food we might be chewing. So now, in addition to not being able to breathe while we swallow, we can’t breathe well even while chewing.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: The 4,900 mammal species that all gathered at our last rendezvous are now swamped by 9,600 birds joining us and 7,770 reptiles, bringing us to a grand total of about 22,300 species!

#17 Rendezvous: Greet your AMPHIBIAN cousins!

TIME: 340 million years ago, so only 30 million years have passed since our last rendezvous with the Reptiles and Birds. We are still in the Carboniferous Period of the Paleozoic Era.

WHERE: **at the edge of a pond**

WHO JOINS? 5,000 species of **living frogs, toads, and salamanders**.

CONCESTOR 17 is your 175 millionth great-grandparent.

FORM: The eggs we hatch from do not have waterproof shells, so we have to hatch in moist environments and we spend our early youth as **a fishlike tadpole!** This is **the first time we can breathe underwater!** We still have legs in our adult form, though, and we still have lungs to breathe on land, but we can't stray far from water, as we have to keep our skins moist.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 27,000

#18 Rendezvous: Greet our LUNGFISH cousins!

TIME: 417 million years ago, right around the time when the Silurian was ending and the **Devonian** was beginning, during the Paleozoic Era.

WHERE: This evolutionary transition took place fully in water, **freshwater**.

WHO JOINS? There are six species of **lungfish** alive today: 1 in Australia, 1 in South America, and 4 in Africa. They all live in freshwater ponds in dry climates so that the ponds periodically dry up. When that happens, the lungfish burrow into the mud and become dormant until rain comes and the pond forms again.

CONCESTOR 18 is your 185 millionth great-grandparent.

FORM: The 1 species of Australian lungfish is probably most like our common ancestor because it has 1 lung; the other 5 species of lungfish all have two lungs. The lung probably evolved not so much to cope with a dried up pond but to cope with stagnant, oxygen-poor conditions, when they would surface and gulp air into the lung. Carp live in stagnant ponds today, and they gulp air, but they don't have a lung. The most visible change is that we now **say goodbye to our legs and arms**. Instead, we now have "lobe-fins" — 4 fins positioned like legs, and made of stubby bones that extend beyond the main part of the body.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Only 6 more than at the last rendezvous, so still roughly 27,000 living species.

#19 Rendezvous: Greet our COELACANTH cousins! (pronounced SEAL-uh-kanth)

TIME: 425 million years ago, during the **Silurian** Period of the Paleozoic Era. This is only 8 million years earlier than our previous rendezvous with Lungfishes.

WHERE: We must **bid farewell to the land and freshwater forever**, as this and all further rendezvous take place fully in the **sea**. Goodbye land! Goodbye freshwater!

WHO JOINS? 2 living species of Coelacanth join us on our pilgrimage now. Rather, we join them — as all 27,000 ambassadors into the past **take a plunge into what we now call the Indian Ocean**.

CONCESTOR 19 is your 190 millionth great-grandparent.

FORM: **No more lungs** (although we do have what is called a “swim bladder” that helps us adjust to pressure changes when we swim at different depths! We still have 4 lobe-fins on the underside of our bodies. Back in the Silurian Period there were lots of different kinds of lobefin fishes that probably lived in lots of different saltwater environments. The living coelacanths all live very deep in the ocean, and that’s why it took until 1938 for scientists to discover them. We had found lots of their fossils, but we thought that all the coelacanths died out long, long ago — even longer ago than the dinosaurs died out. So when living coelacanths were accidentally discovered in a fishmarket in 1938, we declared them to be “living fossils.” One scientist at the time explained that it was just as exciting as if a dinosaur had been found to still be alive somewhere.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Since only 2 more species have joined our pilgrimage, we still have about the same number as at our rendezvous last time: 27,000.

#20 Rendezvous: Greet the RAY-FINNED FISHES!

TIME: 440 million years ago, during the earliest part of the Silurian Period of the Paleozoic Era. This is only 15 million years earlier than our previous rendezvous with Coelacanths.

WHERE: In the ocean.

WHO JOINS? All 23,500 living species of ray-finned fish, meaning everything that we consider to be a **fish**, including eels and flounders and seahorses, as well as fishy-looking fish (but not sharks). Also, all the living species of freshwater fish join us too, (like carp, trout, pike, gar, and sturgeon), but these freshwater fishes all have to swim downstream through the rivers and join the rest of us pilgrims already submerged in the world's ancient oceans.

CONCESTOR 20 is your 195 millionth great-grandparent.

FORM: Say goodbye to the bony lobe-fins that felt somewhat like four legs: we **now have fins** with just rays of bone and cartilage projecting out of the body.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: For the past 3 rendezvous we have stayed at about 27,000 total pilgrims. But now our ranks swell to 50,500!

#21 Rendezvous: Greet the SHARKS!

TIME: 460 million years ago, during the middle part of the Ordovician Period of the Paleozoic Era. This is only 20 million years earlier than our previous rendezvous with Ray-Finned Fishes.

WHERE: In the ocean, of course.

WHO JOINS? 850 living species of **sharks and rays** (including the big manta ray).

CONCESTOR 21 is your 200 millionth great-grandparent.

FORM: This concestor probably looks like a shark. Wow! Inside we are changing, as we **lose all our bone** at this rendezvous and it becomes soft cartilage. There is a famous scary movie about sharks, titled "Jaws." We should pay tribute to our jaws now because at our very next rendezvous we are going to lose them forever, just as we already lost our legs and our lungs forever.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 51,350.

#22 Rendezvous: Greet the LAMPREYS and HAGFISH!

TIME: We move 70 million years further back in time to 530 million years ago, during the early part of the Cambrian Period of the Paleozoic Era.

WHERE: In the ocean, of course.

WHO JOINS? 41 species of lamprey and 43 species of hagfish

CONCESTOR 22 is your 240 millionth great-grandparent.

FORM: We **no longer have movable jaws** but, our shared concestor probably isn't as gross as the jawless fish alive today: lampreys and hagfish. Both have eel-like bodies. Lampreys have round sucker mouths lined with little teeth. Lampreys feed by latching their sucker mouths onto the bodies of live fish and sucking the blood. But the hag fishes are grosser; they are very slimy and wiggle into dead fish and whales to eat them from the inside out.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Nearly 51,500 species — all the living vertebrates!

#23 Rendezvous: Greet our LANCELET cousins!

TIME: Estimating the time suddenly becomes very hard to do, but it is probably about 560 million years ago. This is only 30 million years earlier than our previous rendezvous, but it is momentous, as we are no longer in the Cambrian. Indeed, we have **left the Paleozoic Era**, and are now into the Proterozoic — what used to be called the Precambrian

WHERE: In the ocean, of course.

WHO JOINS? 25 species of living lancelet that are small, live in the ocean, and look like a very sophisticated worm.

CONCESTOR 23 is your 261 millionth great-grandparent.

FORM: Lancelets lack a true backbone, but they have a **notochord** running down their back so they are still a “chordate.” We have **lost all trace of fins**, but **we still have a tail of sorts**. The gills are used not for breathing but for filtering out food particles. So **we no longer breathe at all!** (We absorb oxygen through our skins, so we have to stay small.)

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Because 25 lancelets don't make a big difference in our already swollen ranks, let's use the same number as we used at our last rendezvous for total ambassadors: 51,500.

#24 Rendezvous: Greet the SEA SQUIRTS!

TIME: 565 million years ago; only 5 million years earlier than our last rendezvous with the lancelet. This is a very rough estimate, however.

WHERE: In the ocean, of course.

WHO JOINS? 2,000 described species of Sea Squirts.

CONCESTOR 24 is your 275 millionth great-grandparent.

FORM: The adult form of the Sea Squirt is like a feeding sack planted on a rock. It is **a filter feeder with 2 siphons and it never moves**. Worse, it has no brain! But our actual concestor was not that bad off. It resembled the larva of a sea squirt, not an adult sea squirt. The larva looks sort of like a frog tadpole, and it still can move and it still has a brain. Our concestor surely doesn't have an eye that can focus with a lens, but it may still have an eyespot to sense light and dark.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 53,300.

#25 Rendezvous: Greet our STARFISH cousins!

TIME: 570 million years ago, perhaps just 5 million years before our previous rendezvous with the larval form of Sea Squirts.

WHERE: In the ocean, of course.

WHO JOINS? 6,000 species of Echinoderms, which include **starfish, sea urchins, and sea cucumbers**

CONCESTOR 25 is your 280 millionth great-grandparent.

FORM: Even though almost all the living forms that join us at this rendezvous have radial (like a bicycle wheel), rather than bilateral (left-right) symmetry, the common ancestor (concestor) at this rendezvous was not radial; it was more like **a worm-shape**. The echinoderms then developed radial symmetry on their own after the rendezvous. But the most important thing to know at this point: Surely we are now **BRAINLESS**, although we may have some nerve ganglia in spots. And we have also **lost our blood**. We now have piped seawater circulating inside us instead of blood.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: approximately 60,000.

#26 Rendezvous: Greet the BULK OF THE ANIMAL KINGDOM!

TIME: We really don't know, but a good guess is maybe 20 million years before our last rendezvous with starfish. So that puts us at 590 million years ago, in the Proterozoic Era.

WHERE: In the ocean, of course.

WHO JOINS? Almost all other animals: **mollusks** from clams to octopuses, all kinds of **worms** — from roundworms to annelid worms to tapeworms — **brachiopods, bryozoans, crustaceans** from shrimp to crabs, and a whole contingent of land creatures: all the **insects and arachnids** (spiders) and millipedes. In total, **more than a million new species**.

CONCESTOR 26 is your 300 millionth great-grandparent.

FORM: All the rich diversity of forms evolved much later, from shelly clams to winged butterflies, but the concestor that they all share with the rest of us animals **looked like a worm**. Remember when we were in our endless "rat stage" awhile back? Well, we are now in the endless "worm stage." The key distinction between our group and the newcomers is a technicality of embryological development (our deuterostome form of early development v. the protostome form). But we can reasonably guess something important about our shared concestor: Like us, it still has a front end with a mouth and a back end with an anus. It probably had a pair of eyespots to sense light and dark, but no image-forming eye.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: **This is the largest influx of new ambassadors in our entire journey!** Representatives from more than a million living species now join the mere 60,000 of us that had gathered together at the previous rendezvous. So let's round the total to 1,100,000.

#27 Rendezvous: Greet the PRIMITIVE FLATWORMS!

TIME: Oh, let's guess 630 million years ago, 40 million years before our previous rendezvous with the vaste horde of the Animal Kingdom.

WHERE: In the ocean, of course.

WHO JOINS? 330 species of primitive flatworm, including the famous Planaria that many of us encountered in biology class.

CONCESTOR 27 is your unknown billionth great-grandparent. As we move into the billions of generations, Richard Dawkins (the author of the book on which this ritual is based) stops trying to estimate generation time between rendezvous. So **this is the end of talking about great-grandparents!**

FORM: The primitive flatworms who join us have no body cavity for specialized organs, and — get ready for this — there is **no longer any distinction between mouth and anus**. Rather, food and waste probably exit by a single hole. Note: Tapeworms are flatworms but they are not primitive kind of flatworm; the ancestors of tapeworms had a body cavity and full digestive tract, but the parasitic lifestyle allowed them to devolve those specialties. Overall, we know that we can **kiss our anus goodbye and perhaps our eyespots too**. On the plus side, our shared ancestor, like some of the primitive flatworms alive today, may have contained **symbiotic algae**. Some living forms rely so much on algae to share food with them that they have also lost their mouths!

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 330 new ambassadors is not even recognizable to the existing pool of 1,100,000 pilgrims that we amassed at our previous rendezvous, so the total remains unchanged.

#28 Rendezvous: Greet our JELLYFISH cousins!

TIME: Oh, let's guess 700 million years ago, 70 million years before our previous rendezvous with the primitive flatworms.

WHERE: In the ocean, of course.

WHO JOINS? Some 9,000 species of living **jellyfish, sea anemones, and corals**.

FORM: Many of the living sea anemones and corals contain **symbiotic algae**, so maybe this ancestor, like the last, also had brought us into intimate partnership with the plant kingdom. Certainly, our shared ancestor was not nearly as sophisticated as living jellies, all of whom acquire their planktonic (or larger) prey by injecting them with poisons by launching tiny harpoons hidden in single cells.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Again, even 9,000 new living species joining us doesn't make a difference to the estimate we gained two rendezvous back of 1,100,000.

#29 Rendezvous: Greet our COMB JELLY cousins!

TIME: Completely unknown, but it has to be sometime before our previous rendezvous date of 700 million years ago with the jellyfish.

WHERE: In the ocean, of course.

WHO JOINS? Some 100 living species of Comb Jelly, technically called Ctenophores.

FORM: Like the jellyfish and corals, Comb Jellies have a nerve net, but we don't know whether or not our shared ancestor with them had a nerve net. Comb Jellies today differ from jellyfish in not harpooning and poisoning their prey; instead they use a kind of lasso with sticky glue on it to capture food. But this is probably more sophisticated equipment than the ancestor had. Also, some of them have thin flat body forms like ribbons in the sea, and with no head or tail end.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Again, 100 representatives of Comb Jellies don't make any difference to the 1,100,000 pilgrims that greet them now.

#30 Rendezvous: Greet our PLACOZOAN cousin!

TIME: Oh, let's guess 780 million years ago, 80 million years before our previous rendezvous with the vast horde of the Animal Kingdom.

WHERE: In the ocean, of course.

WHO JOINS? **Just one single living species** within the entire phylum Placozoa.

FORM: We lost our anus a long time ago, and **now we surely lose our mouth and our entire digestive tract**. Instead, we absorb our food through our skin. We look like a large (3 millimeter) **ameba**, with no front or back end, though we do have a "down", as we glide along on an underside of beating hairlike cilia. If our ancestor is anything like the living Placozoan, we are no longer a predatory jellyfish or comb jelly that contains symbiotic algae; but we dine on single-celled algae. Certainly, **we have no neurons** in our bodies at all (and we may have lost them at our previous rendezvous).

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Still at the same number of pilgrims we acquired 4 rendezvous ago: about 1,100,000.

#31 Rendezvous: Greet our SPONGE cousins!

TIME: Probably around 800 million years ago, perhaps 20 million years before our previous rendezvous with the single living species of Phylum Placozoa.

WHERE: In the ocean, of course.

WHO JOINS? Some 10,000 species of living sponge.

FORM: Prepare to **kiss your "body" goodbye**, as sponges are the last multicellular group we rendezvous with. And the only way we hold it together as a multicellular creature at this first manifestation is **by standing absolutely still; we cannot move**. Fortunately, if part of us is eaten or crushed, the individual cells within us can scatter and then come together again to form a new sponge form. We live by passing a ceaseless current of water through us, entering through any number of holes.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Again, even 10,000 new living species joining us doesn't make a difference to the estimate we gained five rendezvous back of 1,100,000.

#32 Rendezvous: Greet our FIRST SINGLE-CELL cousins!

TIME: Oh, let's guess 900 million years ago, 100 million years before our previous rendezvous with the sponges.

WHERE: In the ocean, of course.

WHO JOINS? 140 species of living Choanoflagellates.

FORM: **We are now single cells**, each with a single **whiplike flagellum** that we can use to propel us. Sometimes, however, we gather together into small, loose colonies — though not as structured as the sponge. And, unlike the sponges, we no longer have any differences in the forms that the cells take. We have **lost specialized cells**.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Again, 140 living species joining us doesn't make a difference to the estimate we gained six rendezvous back of 1,100,000.

#33 Rendezvous: Greet our DRIP cousins!

TIME: Oh, let's guess 950 million years ago, 50 million years before our previous rendezvous with the sponges.

WHERE: In the ocean, of course.

WHO JOINS? 30 species of living single-cell creatures that are parasitic on freshwater fish, crayfish, and amphibians in the tropics. (Scientists have given this group the nickname of "**drips**.")

FORM: We have no idea. Think about it: All the living drips are parasitic on fish, crayfish, and amphibians — but there were no multicellular creatures around to parasitize when the ancestor of them and us lived. So the ancestor surely is not parasitic, and it couldn't have lived in freshwater because the later ancestors didn't. Alas, the only thing we can know about this ancestor is that its form was a **single cell**.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Again, 30 living species of DRIPS joining our pilgrimage doesn't result in any change to the estimate we gained seven rendezvous back: 1,100,000.

#34 Rendezvous: Greet our FUNGUS cousins!

TIME: Completely unknown.

WHERE: In the ocean, of course.

WHO JOINS? **Finally, we have another large influx of pilgrims** to join us on our journey. There are 69,000 species of living fungi that have been described, but that is a tiny fragment of the estimated 1.5 million living species of fungus.

FORM: When we think of fungi, we think of mushrooms. We also know that **the largest living organism on the whole planet** is the underground mycelial mass of a fungus in Michigan. But, just as with us animals, the form of *living* fungus is a far cry from what the shared ancestor between animals and fungus would have been. And, like all the rest in our journey back in time, it was surely **a single-cell critter living in the ocean.**

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Our ranks have more than doubled: from 1,100,000 living species to a total of 2,600,000 living species.

#35 Rendezvous: Greet our AMOEBOZOAN cousins!

TIME: Completely unknown.

WHERE: In the ocean, of course.

WHO JOINS? About 5,000 living species of single-cell creatures that look like amoebas, plus the social amoebas known as **slime molds.**

FORM: Something like an **amoeba.**

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: 5,000 living species of amoeba joining us doesn't make a difference to the estimate we gained when the fungi joined us at our last rendezvous: 2.6 million.

#36 Rendezvous: Greet our PLANT & (green & red) ALGAE cousins!

TIME: Unknown.

WHERE: In the ocean, of course.

WHO JOINS? 30,000 living species of green **land plants** and **green algae**, plus about 5,000 living species of **red algae**.

FORM: The living pilgrims joining us now come in all shapes and sizes: from giant sequoias to tiny mosses and single-celled algae. But the concestor that joins the plant world with our animal/protist/fungal world would have been a very primitive single cell — and surely did not photosynthesize. Living plants and algae are composed of cells that are actually more sophisticated than any individual cell found in us animals, protists, and fungi. This is because, while both groups have mitochondria inside our cells in order to breathe oxygen, **only plants have chloroplasts**, which perform photosynthesis. Photosynthesis is, of course, happening on Earth at the time of this concestor, but the concestor (the shared ancestor of plants and animals) is not doing it. What will evolve into plants will gain that ability “later”, when photosynthetic bacteria are taken into the cell via **symbiosis**. This will be one of the great events of Earth history — but it is not happening in any of our animal concestors.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Sadly, 35,000 living species of plants and algae doesn't really make a difference in the 2.6 million pilgrims we measured at our last rendezvous, but because many algae and amebas (the previous) juncture are surely undiscovered, let's round that up to 2.7 million total pilgrims.

#37 Rendezvous: Greet the REMAINING EUKARYOTES!

TIME: Perhaps 2 billion years ago.

WHERE: In the ocean, of course.

WHO JOINS? 50,000 living species have been described of a vast variety of eukaryotes that are related to animals, fungi, plants, and green & red algae at some lower level. We have no idea as to the actual time sequence that each group joins our pilgrimage, so we will pretend that they already all joined up together in the own pilgrimage, and thus meet us at this juncture as a single group. This varied group that brings in the remaining eukaryotes include living species as distinct as parasitic **Giardia**, shelled **foraminifera**, **radiolaria** that craft lovely little shells, photosynthetic **diatoms**, **euglena**, and all the **brown algae** — including gigantic multicellular forms of ocean **kelp**.

FORM: The concestor surely was a single cell that contained mitochondria and thus "breathed" oxygen.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Surely, far more tiny eukaryotes have yet to be discovered, so let's boost our numbers from the last rendezvous of 2.7 million total pilgrims to an estimated 3 million pilgrims.

#38 Rendezvous: Greet our ARCHAEA cousins!

TIME: Sometime between 2 billion years ago and the origin of life 3.8 billion years ago.

WHERE: Perhaps the ocean, or perhaps where we find most Archea today: **deep within the crust of Earth** — in the “Deep Hot Biosphere.”

WHO JOINS? The first of 2 groups of what used to be called, “Bacteria.” The group that joins us first are the Archaea, which today include the life forms that live in the most extreme environments on — and within — Earth. Notably, some are thermophiles, living in **hot springs, ocean vents, and deep within Earth.**

FORM: This concestor marks a major juncture in Earth history, for we now **say goodbye to a nucleus!** Rather, the genetic material within the single cell of this concestor is no longer sequestered from the rest of the cell. And we can also **say goodbye to the mitochondria** we have carried in our cells thus far in our journey. **Say goodbye to “breathing” oxygen!** For this concestor that greets all of us eukaryote pilgrims and the merging lineage of archaea cousins would have had an anaerobic metabolism.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: At Archaea, **we stop being able to count species because there is no such thing as a true species at this level!** Instead, genetic material is easily traded *laterally* among the archaea. But, we do know this: the total mass of Archaea alive *within* Earth today (the “deep hot biosphere”) far exceeds the total mass of the rest of the species that have already joined our pilgrimage. So at this point, **we really bulk out!**

#39 Rendezvous: Greet our EUBACTERIA cousins!

TIME: Sometime between 2 billion years ago and the origin of life 3.8 billion years ago, but probably earlier in Earth history than our previous rendezvous with Archaea cousins.

WHERE: Perhaps the ocean, or perhaps where we find most Archea today: deep within the crust of Earth — in the “Deep Hot Biosphere.”

WHO JOINS? **All the rest of the bacteria**, which include all the ones that cause human diseases (e.g. spirochetes like those that cause **syphilis**; bacteria like those that cause **staph infections** and Chlamydia). Some eubacteria also photosynthesize: these are the **cyanobacteria**. The cyanobacteria will merge with ancestors of green algae and plants to become photosynthetic chloroplasts.

FORM: This question is too confusing to even think about. This final concestor comes very close to the origin of life, right at the point where the first split in life forms still alive occurs: when the eubacteria and the archaea first differentiated.

TOTAL # LIVING SPECIES ON THE PILGRIMAGE NOW: Again, “species” is an irrelevant concept to the gene-sharing bacterial world, so let’s just remember that these pilgrims are far more important to the metabolism of Earth than we are, and that they have infiltrated all the rest of us, as they supplied the mitochondria by which all eukaryotes breathe and the chloroplasts in plants. What we can say is that now, at concestor 39, our swarm of pilgrims now contains ambassadors from absolutely **every form of life alive today!**

Officially, the concestors have thus ended, but we shall take one more step:

#40: Origin of Life!

TIME: 3.8 billion years ago.

WHERE: Perhaps an ocean vent or deep within Earth's crust.

WHO JOINS? Nobody. Everybody alive today has already joined the pilgrimage at our last rendezvous. So this final step, #40, is simply for us all to keep heading back through our lineage of shared ancestors until we meet the first semblance of life — whatever that might have been.

FORM: A great mystery! And this juncture, from non-living to living is the greatest shift of all. Praise the mystery! Praise LIFE! And praise our Planet Earth and the vast and creative Cosmos which, together, are capable of manifesting Life! Praise all the ancestor stars who lived and died before our Sun was born, and who forged the very atoms in our now-living cells!

THE END.