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PHYLOGENESIS

(from Babylon Sisters)

Life is tenacious, life is ingenious, life is mutable, life is fecund.

Wildflowers spring from vast fields of pillowy black lava barely cool. Bacteria dwell in pockets of oil squeezed between seams and strata, and they proliferate in anaerobic and glacial niches. Nodding fronds and waving worms cluster around hot mineral springs gushing from the floor of the sea, lightless and under immense pressure. Dead staffs, cut years gone by, planted in good soil, take root and sprout leaves. A subarctic pine thick as a pencil, when examined, reveals seventy annual growth rings. Fish and frogs are immured in mud during years of drought, to reawaken with the first rains. Herman Melville once heard a gnawing sound from within a favorite table and watched an insect bore its way out of the unblemished surface, having gone dormant in the original tree from which the table was made decades ago.

Most hardy, most tenacious of life—if living they can indeed be called—are perhaps the viruses. Classified as obligatory parasites—doomed always to an existence dependent on other organisms—barely more than some nucleic acid in a protein coat, they can lie in wait in animate—smallpox in a blanket—for a passing host. Given merely an instant's contact, they will plant themselves and flourish.

But all these examples, however diverse, presuppose at least a minimal planetary environment, a nurturing biosphere. Without that—when a planet dies—can life endure?

This was the vital problem the human race found itself facing.

The invaders came to Earth from space without warning, their skins hardened for atmospheric reentry. In blind fulfillment of their life cycle, they sought biomass for conversion to more of their kind. Earth offered all they needed.

Only in the final days of the plague, when the remnants of mankind huddled in a few last redoubts, did anyone admit that extermination of the invaders and reclamation of the planet was impossible. The ecosphere had been fundamentally disrupted, damaged beyond repair.

Then did the chromosartors begin to work feverishly to adapt a new man to the alien conditions. With a snippet from the marsupials, a string from the Pinnipedia, incorporating dozens of other genetic components, they refashioned woman and man for the new conditions.

And their overall model, the organism they felt offered the best tactic for survival, was, out of all creatures, the most simple.

Virus.

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The host was sick. Here in its adult environment, without predators its own size, capable of a long, long existence, it had succumbed to infection. In the forbidding vastness of circumsolar space it wallowed, out of control, plainly dying.

Stars hung in the limitless vacuum, pinpoints sharp as loss: orange, blue, white, ruby. One blazed only a few Astronomical Units away, correspondingly more dominant. These luminaries were the only watchers. There was no active mind present to care about what was to occur.

Scale was hard to determine in this wilderness, but the stricken creature seemed to occlude a goodly number of stars with its bulk, in its spasmodic progression through the vacuum.

Ripples pulsed across the organism's elastic surface, convulsions engendered by unseen internal disquiet. It was plainly a system out of control.

These wavelike motions picked up speed, acquired a crazy tempo, like that of a fibrillating heart. The host looked

like an amniotic sac disrupted by the frantic movements of its strangulating inhabitant.

Suddenly, noiselessly, without warning, the host ruptured. Amorphous fragments and thick sheets of biological substances—along with liquids and gases—blew off and scattered in every direction, the solids pinwheeling and tumbling end over end.

Among these useless fragments were several large flocks of objects that seemed still viable. Small ovoids, complete and self-contained, these were the vesicles. Unlike the object that had expelled them, they were born helpless, without control over their course. They radiated off into the depths of space, limning the surface of a ghostly, expanding sphere.

There happened to be no other hosts in the immediate vicinity. The vesicles were thus doomed to wander indefinitely.

The hosts—the prey of the vesicles—although much larger and more capable than the aimlessly floating parasites, were still insignificant targets, compared to the distances that separated the two.

But time was long, and any likely event must come to pass. Eventually, the vesicles would chance to meet a new host.

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There was movement amid the great lifeless night.

A segment of stars was occluded by a tremendous glaucous bulk moving slowly. Its exterior possessed a quasi-organic texture, like a bluish grey compound of fat and plastic. It had a relatively high albedo, so it was rather bright. Its shape was a featureless ovoid. It resembled nothing so much as a titanic mottled pill-capsule.

In its creeping passage, the host was moving toward something that seemed, at first, a single smaller object with many components. This object was also moving, on a path tangential to the host. As the distance between the two objects narrowed, the latter resolved itself into a flock of discrete entities.

The vesicles' long unconscious seeking was almost at an end. The gravitic memory of their ejection from a common source with identical force and trajectory had kept them together on their uncontrolled flight through the long night, a cluster of small pods that were identical in substance to the host.

Now the foremost portion of the host intersected the flock of vesicles. Some stuck, held not by magnetism or gravity, but by adhesive forces biological in nature. Others—too far away or not tenacious enough—drifted by, losers in the cosmic lottery.

The ones that had clung to the host had a chance to live and reproduce. The ones that had failed to catch on would, in all likelihood, die. Perhaps they would plunge into this system's sun. Perhaps they would simply wither away, their natural capacities exhausted, their dormancy become final death.

The host emerged from the diminished cloud of vesicles. The two units continued on their separate paths. The sleek uniformity of the host's thick skin was now broken by the scattered forms of the clinging vesicles, like limpets on a rock. But there was no reaction from the host to this change in its condition. It seemed unaware of its doom. No host, in fact, had ever been known to exhibit sentience.

The vesicles, however, sensed the difference in their state, and they emerged from dormancy. Interior cellular mechanisms began to switch on.

Soon, the portion of the vesicles in contact with the host began to secrete a lysis-promoting enzyme. The integument of the host beneath the vesicles began to dissolve. After a short time, the vesicles and the host were immutably fused together. The vesicles continued to eat inward, single-mindedly following a program laid down long ago.

The wounds on the host closed with temporary patches slowly behind the invaders, thwarting the release of the host's interior components into the vacuum of space.

The invasion took place in utter silence, no cries or alarms sounding in the desolation of space, despite the life-or-death nature of the struggle. Success did not lie solely with the invaders. Some defective capsids were stopped by subcutaneous membranes that formed a second line of defense. Their contents were enzymatically absorbed. However, most of the capsids soon penetrated the thick hide of the host completely, gaining access to

its interior structure: a labyrinth of cells and arteries, nerves and organs, structural tubules and struts, all lit with exceeding dimness by a yellow-green bioluminescence.

A nonhomogenous environment of wet and dry spaces, some cluttered with pulsing conduits and organs, some home to roving organelles, others like the empty caverns formed in foam.

At the immediate instant of gaining entry to this variegated interior, the vesicles discharged the machinery of subversion, their living blueprints, the carriers of heritage and the template for the formation of more vesicles.

Throughout the interior of the host, falling with liquid plops from the exhausted, dying vesicles, scores of naked neohumans in all stages of maturity landed on their backs and sides and bellies, coughed up pints of fluid, and became instantly aware.

The host had now fully sealed off the holes made by the vesicles, preventing the vacuum from entering, but it was too late to forestall the real damage.

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6-Licorice opened his brown eyes. He wiped his lips and chin clean of the gelatinous fluid that had until this moment filled his lungs. Already the estivation medium was drying on his body, turning into opaque white flakes that would soon fall off like scales. It felt good to be awake once more—to be alive. It seemed only minutes ago that he had entered his capsid, there to dream uneasily of his short but full life—the past and what might come—but he knew he might in reality have been asleep for years.

6-Licorice lay for a second or two, considering how lucky he was to have survived. Such a short moment of reflection was all he could afford, here in this nurturing yet hostile environment. Then he levered himself up agilely off the warm rubbery floor.

6-Licorice was a fully mature adult neohuman, a fine exemplar of his species in the only form in which it existed now. He stood four feet tall, with limbs rather gracile than muscular. He was completely hairless. His eyes were big, the pupils big within them. His genitals were hidden in a pouch of skin. There was a thick crease or fold of flesh across his otherwise flat stomach.

The first thing 6-Licorice had to do was find out if 3-Peach had made it too.

6-Licorice surveyed his surroundings. He was in one of the drier corridors —roughly cylindrical in cross section— which threaded the flesh of the host immediately beneath its tough skin. (All hosts exhibited an almost manufactured uniformity.) The texture of this corridor was fibrous, almost vegetative. The jaundiced light generated by the host's substance—although dimmer than moonlight—was perfectly adequate for 6-Licorice's large eyes. It was in fact the only form of illumination he had ever known.

Sniffing the moist air, 6-Licorice failed to detect 3-Peach's scent/taste. So he moved to one of the walls, where he found by touch a buried vein, which he bit into with sharp teeth.

One of the many nourishing juices the host provided filled his mouth. 6-Licorice drank it gratefully.

After a few swallows, 3-Peach's taste/scent came to him: her saliva, mixing with the host's fluids, where she too drank upstream. (Had 6-Licorice been upstream of 3-Peach, she would have responded in the same way to his trace.) It was an unmistakable and unique mix of chemicals, being bound up into her very genes, and it possessed a special affinity for all those of 6-Licorice's lineage.

A string consisting of three molecules of allyl cyclohexylcaproate; two of allyl phenoxyacetate; five of cinnamaldehyde: 3-Peach-2-Honey-5-Cinnamon—his mate, his love, the complement to the special cargo of chromosomes that was his share of neohumanity's continued perpetuation.

She was here! She had survived!

6-Licorice left the dribbling wound he had made in the host and began to run up the passage, in the direction from which the liquid had flowed to him.

Luck was with him, for he met no macrophages or lymphocytes or other harmful scavengers on the way. This was as expected, a kind of grace period, it being really too early for the host to have mobilized its defenses yet. Immunologically speaking, the host was still in the primary response stage.

In a short time, 3-Peach's scent/taste filled his nostrils. He picked up his pace.

Attracted by his airborne signature, 3-Peach came running around a corner to meet him.

They collided in an ecstatic embrace and fell to the resilient floor.

In a second, instincts rampant, they were mating.

The sex lasted under a minute.

Still, it was intense, tinged with mortality and separation.

3-Peach and 6-Licorice regained their feet as soon as they were done. There could be no post-coital sleep or restful talk for them. Their world was too relentless.

"Oh, 3-Peach, I'm so glad you made it!"

"And me for you, 6-Lick!"

3-Peach fondly patted 6-Licorice's wet detumescing genitals as they withdrew into their pouch. He stroked her flat, nippleless chest in return.

"That was nice," said 3-Peach. "I'm sure it'll be five healthy ones this time."

"Me too," replied 6-Licorice.

Arm in arm, they set off easily, but with an underlying wariness, to meet briefly with others of their kind.

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Out of the large cluster of vesicles, only a bit over two hundred had managed to make contact with the host, the rest sailing off into the cold, destructive darkness. A small percentage of these vesicles had contained children of varying ages. The rest had harbored adults, like 3Peach and 6-Licorice. And like that couple, the others had quickly mated: with their prior mates, if those individuals had chanced to come aboard the host also, or with new partners whose mates had also failed to be picked up like interplanetary cockleburrs on the back of the host.

Thus, within an hour of the invasion of the host, roughly a hundred pregnancies had been successfully started.

With this all-important task out of the way, the neohumans set about establishing themselves firmly in the host.

Basically, this procedure involved scattering themselves throughout the interior of the gargantuan alien. They could not settle down into a single large community at this stage, unless they wished to chance being completely wiped out in a massive attack by the host's defensive entities and its immune responses. The concentration of so much nonhost antigenic protein would have stimulated an immense marshaling of macrophages and lymphocytes by the host, floods of interferon analogues, which the neohumans would have been hard-pressed to survive.

Therefore, the various couples betook themselves to isolated portions of the host, living for a time like independent frontiersmen of another age. They walked through mazed passages crimson as blood, and rode the sticky turbid currents through large arteries. (These neohumans could go without breathing for as long as twenty minutes, thanks to their seal heritage.) They climbed through honeycombs of spongy lipid-yellow wet tissue just as their remote ancestors had climbed through vines and branches. They burrowed through thin cellular walls when necessary, using their teeth and tough nails.

Some died along the way, by drowning or suffocation or ingestion by the patrolling macrophages: roving jellyglobes as big as the neohumans, motivated by chemotaxis, attraction along chemical gradients. If a couple were threatened together, the male would often sacrifice himself, to ensure the escape of the female and her gestating burden.

Eventually, nearly two hundred neohumans were distributed throughout the entire host.

And exactly thirty days to the minute after their entry into the host—the neohumans monitored the passage of time with unerring precision, thanks to long-ago modifications in the suprachiasmatic nuclei of their brains, which provided them with accurate biological clocks—roughly one hundred women gave birth to their litters.

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“Get ready, 6-Lick—they’re coming!”

3-Peach rested in one corner of the red-walled, veined humid cavity she and 6-Licorice called home, her legs wide apart, knees drawn up to her ears and gripped tightly. 6-Licorice squatted patiently in front of her, awaiting the births.

Without visible effort, 3-Peach squeezed out the first of her litter. To the eyes of another era, the infant would have looked premature, almost fetal. And in truth, it could not yet survive on its own.

Which was why 6-Licorice took it tenderly and, pulling open the crease of flesh across his abdomen, inserted it gently inside, where it fastened to a hidden nipple.

He did the same with the other four.

Then he and 3-Peach immediately had sex again, to start another batch, moving less frantically than that first time, cautious of the pouched young ones.

When they were finished, 3-Peach—always more optimistic than her mate—said, “They all looked fine, didn’t they, 6-Lick?”

6-Licorice softly pressed his abdomen. He had been worried about mutations—induced by cosmic radiations experienced as their vesicles had traveled through space—as much as she.

“Yes, they did. And I’m sure the next four or five litters will be just as strong.”

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The neohuman population of the host, after the first birthings, now stood at roughly seven hundred, more than double the number of initial invaders. True, there was not much outward show of this leap yet, since the newest neohumans were all still pouch-bound.

However, at the end of the second month, when all the males were waddling about awkwardly, the first litter came forth, independent, self-mobile, able to feed themselves from the body of the host, not talking yet, but on the verge of speech. They vacated the pouches of the males just in time for the next generation to go in.

(6-Licorice, at the end of each cycle, looked more pregnant with his distended abdomen than 3-Peach ever did.)

The second litter safely pouched, the first afoot, a third litter soon occupied all the neohuman wombs.

By the end of six months, the neohuman population of the host stood at three thousand plus. And the oldest children were half as big as their parents.

At the end of one year, there were six thousand members of the community of invaders who had never known a life outside this present host. The original two hundred settlers, through attrition, were down to one hundred and fifty, 3-Peach and 6-Licorice being among them.

Now the oldest children, aged one year and fully adult, began to breed, along with their still fertile parents.

There were four hundred breeding pairs that month. At the end of thirty days, they gave birth to two thousand children.

And the second-oldest generation, a month behind the first, began to breed. Six hundred and fifty pairs gave birth to 3,250 children.

The next month, nine hundred breeders birthed 4,500.

When the next two hundred and fifty pairs came on-line, the result was 5,750 newborns.

And the next month, and the next month, and the next . . .

By the end of the second year, the neohuman population inside the immense host was nearing one hundred thousand.

And they had barely got going.

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Eldest by a few seconds of 3-Peach's and 6-Licorice's first litter, 2-Honey was now slightly more than a year old, an energetic adult with his mother's optimistic nature.

The male neohuman's full designation was 2-Honey4-Licorice-9-Clove. His parents' signatures had recombined uniquely in him, as they would in all his siblings.

By these unique families of signatures the neohumans were divided into clans. Clan membership circumscribed mating, the heart giving way—or rather, indulging itself only within certain boundaries—according to an inbuilt determinism. The long-dead chromosartors had limited their progeny in this way for a particular purpose.

Knowing that thenceforth the human race would possess a basically nonmaterial culture, the chromosartors had pondered what faculties, what cargo of knowledge, they could pass on to the neohumans as a legacy of six thousand years of civilization. They had eventually settled on several talents, chief of which was mathematical skill.

The entire corpus of mathematics was literally encoded in, and distributed across, the collective neohuman genome.

2-Honey's clan was the bearer of Riemann integrals. They were born with a predisposition toward solving those abstruse functions in their heads. The circumscribed mating choices insured that the ability would be passed from generation to generation.

2-Honey had taken for his mate a female named/tasted 7-Apple-1-Clove-8-Peach, whom he had met half a host away, while eluding a persistent lymphocyte. Ducking into a fibrous maze too small for the lymphocyte to enter, 2-Honey had stumbled on the home of 7-Apple and her family, distant cousins. It had been love at first scent.

One day shortly after birthing their own first litter, the couple was traveling together to visit 2-Honey's parents. The son and his wife had lately, during a heated session, discovered what they believed to be a new aspect of unbounded Riemann integrals. Now they wanted to confirm with their elders that their discovery was actually original and valid. If such was the case, then the new information would be disseminated as widely as possible among their clan, to insure the survival of this knowledge.

As 2-Honey and 7-Apple loped speedily through the corridors, they fell into speculating on the importance of their discovery.

"If only it's real," said 7-Apple. "It would be such an honor. Why, who knows, it might even lead someday, somehow, to the race returning home, to Earth."

"That's a nice dream, 7-Apple," replied 2-Honey absentmindedly. "Even if it is unlikely. Still, we can always hope . . ." 2-Honey's voice trailed off. He was really in no mood to chatter. The long graceful S-curves of integrals occupied his vision, and he was lost in a numinous realm of abstraction.

7-Apple saw the newly grown patch of acid blisters too late, and 2-Honey never saw them at all. She swerved, but he ran right across them.

The blisters exploded, drenching 2-Honey and just spattering 7-Apple.

When 7-Apple opened her eyes, she saw 2-Honey writhing on the floor. Ignoring her own pain, she moved to touch him.

"No—" gritted 2-Honey through clenched teeth. "You'll burn yourself. Liquid. Wash me—"

2-Honey yowled then, high and long. The sound went right through 7-Apple like a cartilage knife. She ran off, trying to erase the image of 2-Honey's bare white bones showing through his flesh.

When she returned, quickly as possible, with a sac of cool juice pinched from a cluster, 2-Honey's legs, the last part of him visible, were just disappearing into the bulk of a macrophage. His appointed fate, delayed since their initial meeting, had at last overtaken him.

7-Apple threw the sac at the macrophage, where it burst uselessly against its peristalsis-heaving form. Then, stifling her grief, sensible that to lose her own life would be to deprive the neohumans of a possibly important discovery, 7-Apple turned and loped on.

She swore every neohuman would come to know of 2-Honey's bravery and genius. Yes, they would!

2-Honey: from birth to maturity, from nescience to supreme intellectual accomplishment, his life had spanned less than four hundred days.

Mayflies, fast-fading blooms, the little creatures of a short hour. Yet to themselves, their lives still tasted sweet as of old.

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More neohumans lived than died. Naturally, the burgeoning population had its effect on the host. This proliferation was the process by which its kind reached their untimely deaths. The neohumans lived off its tissues and byproducts, producing waste products of their own. Such a crowd as now existed was literally devouring it from the inside out, and filling it with metabolic poisons.

The host responded desperately with chemical/biological/physical attacks.

Cell-dissolving enzymes dripped from certain walls and formed pools, which the neohumans warily avoided. Patrols of jelly-globes that would ingest men and women on contact increased. (The neohumans were forced to lick each other regularly from head to toe, in a kind of social grooming designed to remove the chemical tags that allowed the macrophages to zero in on them.) Temperatures in certain areas rocketed to fever levels.

But all these measures were simply too late. The neohumans met the host's offensives with cunning and biological resiliency. The macrophages they simply overwhelmed by numbers, tore apart, and devoured. Eat or be eaten was the only law. The destructive enzymes and other long-chain molecules they countered with biological agents of their own, the neohumans' bodies having been engineered in the distant past precisely to meet such challenges. The walls of living quarters were laved with micturants that had responded to the crisis by altering their composition in a useful manner. Some of the attacks the neohumans were able to shut off by subverting some of the many ganglia possessed by the host.

All was not gloom during these days of increased biological warfare, however. The interior of the host was filled with song. It was the only art form left to the artifact-free neohumans, and they exploited it to its utmost. Intricate choral threnodies for an ancient racial loss, plangent dirges interspersed with bright individual notes celebrating present-day survival, vibrated the tissues of the host with alien stirrings. Plainsong and partsong, madrigals and chorales, these were the supreme weapons in the neohumans' armory of spirit.

At the end of the second year, with the neohuman population approaching half a million, the interior of the host began to appear ineluctably ragged and sick. There were structural failures and organic decay, nauseating stinks and food shortages.

The neohumans were not troubled, for they had expected as much.

They began to prepare for departure.

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6-Licorice and 3-Peach stood at a thick transparent portion in the host's outer skin, once intended to admit sunlight on a bank of dimpled blue swellings, for reasons obscure to them, but obviously plain enough to the host. Now the swellings were dead. But the sunlight entered still.

The host had lost its ability to maneuver against solar gravity, by jetting waste gases and liquids, and had been falling for some time down the invisible gravity well into the Sun. It was also rotating slowly without control. However, its own internal gravity remained constant, keeping the feet of the neohuman couple secured firmly to the wet floor, even when that surface had spun one hundred and eighty degrees.

The rotation brought a new sight into the window: a planet and its satellite. The satellite was immemorially grey and dead, with markings that moved the humans strangely, awaking ancestral emotions. The planet, once green and blue, now resembled a white featureless ball, exactly the texture and composition of the host.

3-Peach and 6-Licorice were silent while the planet remained in view. When it had vanished, 3-Peach said, "Do you think they'll ever leave, 6-Lick?"

"Who can tell? Who knows why they even came? We can't even say if they're natural or artificial. Why do we have weight inside them, for instance? And if they did go, what would they leave behind? Bare rock, no life? No, we can't count on it, we can't even dream about it."

A troop of youngsters surged by, laughing and playing tag. 3-Peach said nothing for a time, until they were gone. Then: "I guess you're right, 6-Lick. We just have to make the most of the life we have."

They left the window, holding hands.

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In the last month of life aboard the host, no females became pregnant, although the couples continued to engage in sex, for reasons of comfort and pleasure. Metabolisms were changing in anticipation of departure.

At last the day arrived. All signs pointed to the imminent collapse of the weakened host.

Each human sought out a macrophage. There were plenty left for everyone, and their viciousness had decreased in these end-days, almost as if they had internalized chemical messages of defeat. These former enemies were now to become the means of escape for the humans.

Approaching the scavengers one on one, the human swallowed themselves to be ingested.

The encounters were far from fatal. A new secretion produced by the humans overrode the macrophages' instructions. In the ultimate subversion, the defensive eaters became protective vesicles, settling down by the thousands to the floor. The humans inside inhaled the altered cytoplasm of the vesicles and gradually lost awareness.

Watching their fellows become encysted by the scores all around them, 3-Peach and 6-Lick paused for a moment before allowing the same necessary fate to overtake themselves.

"It was a sweet couple of years, 6-Lick."

"I can't remember better."

"The kids grew up fine."

"The songs were glorious."

"The math was exciting."

"The sex was marvelous."

"As always."

Silence, save for other soft and private goodbyes. Then 6-Licorice spoke.

"You're the only one for me, 3-Peach."

"And you for me, dear. I can't wait till we're together again."

6-Licorice, not so sanguine as his mate, made no reply but just squeezed 3-Peach's hand.

They went under then, enlarged, cocooned.

Only an hour or two passed, so nicely had the humans timed events.

The host exploded silently, its internal pressure rupturing its damaged skin: the end point of the process begun so many human births ago, with the initial pinholes of entry. It looked like a gigantic seed pod distributing its seeds.

Vesicles were scattered in every direction.

Some embarked on a course straight for the Sun; others seemed destined to impact the Moon or burn up in Earth's atmosphere. Chance dictated the course of each, since they lacked maneuvering capabilities.

3-Peach and 6-Licorice were lost amid the thousands. They had been side by side prior to the explosion. Perhaps they would stay together in their long drift. Perhaps not.

But many would live to breed again.

And again.

And again . . .