Where the Tiny Things Are: Feathered Essays
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It’s the not knowing that’s the worst. In *What to Expect When You’re Expecting*, they tell you what to look for: cramping, fluid, blood. But they don’t tell you much after that. Even though your doctor prescribed a Unisom-equivalent to help you sleep and to keep the nausea down, you woke up to eat a banana every morning at 2 a.m. But at least you kept the banana down, which is more than you could for the first twelve weeks of your pregnancy.

When, almost five months pregnant, you felt the first wave across your stomach, you thought it was plain morning sickness. Morning sickness and waves went together. The first trimester, you felt like you’d been on a boat. Your body rocked with the growing fetus—moody upswings and downswings, up all night, asleep all day, food went down, food came back up. You thought “rocking” but perhaps “wracking” was more appropriate. Still, you’d wanted this. You and your husband had been trying to get pregnant for three years. You had, until you started trying to get pregnant, thought yourself a regular woman. Three years of intrauterine insemination (IUIs), the drug Clomid to increase progesterone, and injected hormones to stimulate regular woman hormones in your own body made you think about your hormones differently. Made you think about “regular” differently. Now you wondered whose life you had been living—you had always pictured yourself with a baby, one in your arms, on your shoulder, against your
hip, hugging your leg. Instead, you have other people’s and other animal’s hormones coursing through your veins. How much “not you” would have to go into making your baby? You’d discussed in vitro fertilization. Even donor eggs, with the obligatory injections of progesterone and other hormones you were not, as yet, required to know the names of. If you could erase that medical jargon from your mind, you would. You won’t even explain the words.

It is Michigan in winter, 2004. Streetlights turn on at four in the afternoon. Through their sodium glare, you look out into the street. You eat rice while looking out the window through the lights. You eat crackers at ten. The lights glare orange. At two in the morning, banana in hand, the lights seemed dimmer. Is the sun coming up already? It’s too early. You count how many nights you’ll be up like this—staving off nausea. Eating tiny meals. Not sleeping as a talisman against bad things happening, as if consciousness could affect the development of fetal brain tissue. Butter does help brain tissue, you know. You should stay up to eat more butter, but butter makes you feel sick, so you hope the fat in crackers makes up for it. You expect crackers to pull double-duty. Make baby brains and keep you from throwing up.

But you don’t exactly feel like throwing up. The tightening you feel goes all the way across your stomach, around your back, and up through the umbilical cord, like you’re pulling a belt too tight. The belt
tightens, then it loosens. Maybe this is the quickening, one of those magic words that does not make you think of medicine but instead of something natural and outdoorsy. You think that roots of trees might quicken with that first sip of rainwater after a long drought. Strawberries quicken when the ephemeral blossom turns to solid fruit. The shaking of a Northern Flicker’s egg. You’re trying to listen to your body, like the midwife you would have used would have advised. But because of your advanced maternal age, thirty-five, you were considered too high-risk and assigned to Dr. Florens, who you like but don’t love. He uses words like hypertension and gestational diabetes rather than quickening. It doesn’t matter, now, it seems. Doctor vs. midwife, it doesn’t matter: at this point you can’t listen to your body because your body is making these moves noiselessly. You can’t figure out what’s going on because the waves keep coming, and you are only twenty-three weeks and four days pregnant, and the only thing this could be you are almost certain it can’t be.

But it is.

Causes: A micropreemie is a baby born weighing less than one pound, twelve ounces (800 grams), or before twenty-six weeks gestation. Because they are born months before their due dates, micropreemies face long neonatal intensive care unit (NICU) stays. Although many
extremely premature babies grow up with no long-term effects of prematurity, others face severe health problems throughout life.

Micropreemies are very fragile, and every day that a pregnant woman stays pregnant increases her baby’s chance of survival. About ten percent of babies survive at twenty-two weeks. At twenty-four weeks, sixty-six to eighty percent. After twenty-six weeks, ninety percent of babies survive.

Yearly, thirteen million babies are born prematurely across the globe—over one million of them die from preterm birth. The number of babies being born early grows every year. The number in the United States has grown thirty-six percent in the last twenty-five years. How could this number increase when healthcare is supposedly getting better? Pregnant women have better access to prenatal health care than ever. Humans supposedly know more than they did. How can we be going backward?

One theory is that for every “advance” humans make, there is an equal step back. For instance, the consequence of making it possible for previously infertile people to become pregnant may contribute to preterm birth, especially if the mother has more than one fetus implanted via in vitro fertilization (IVF). In developed countries, high blood pressure, being overweight, and delaying pregnancy contribute to preterm birth. In developing countries, a lack of nutrition contributes to preterm birth. Tobacco, drug, and alcohol use also unite—all three contribute to mothers giving birth too early across the globe.
It’s not just a mother’s intrauterine environment that causes preterm delivery. The larger environment may play a part. According to a 2009 health report from Environmental Health News, University of California researchers found higher instances of preterm babies born in Long Beach/Orange County. The researchers compared women who lived in Los Angeles neighborhoods with the most traffic-related pollution to women who lived in the neighborhoods with the least traffic pollution. Reviewing the birth records of more than 81,000 infants, researchers found that those in the polluted areas were 128 percent more likely to deliver “very preterm” babies. Fetuses are vulnerable to the toxic substances inhaled by their mothers, theorizes Jun Wu, an assistant professor of epidemiology at UC Irvine and the study’s lead author.

Babies born prematurely can suffer long-lived consequences. For example, prematurity is one of the primary risk factors for developing cerebral palsy. It’s generally agreed that the earlier in the pregnancy that the baby is born, the greater the chance that the child will have impaired cognitive skills or behavioral disorders, as well as chronic problems with vision and hearing.

Science keeps finding ways to keep smaller and smaller babies alive. The risk of poor outcomes doesn’t offset a doctor’s ability to sustain that just-born baby. Technologies adapt to make survival in an artificial environment possible. As scientists begin to discover the causes of premature birth, the understanding of “environment” becomes
complicated. As the neonatologists and surgeons with microscalpels practice their skills on these micropatients, as they adapt their machines and their tools to suit these ever-newer patients, the micropreemies themselves have shown an ability to adapt. The babies’ bodies adjust to artificial lights to remove the bilirubin from their livers. Their skin learns to absorb warmth from heated incubators, and to metabolize intravenous fluids, where originally they metabolized food through the placenta via the umbilical cord.

Even the mother’s body can react to change. Micro-premature infants have different metabolisms and dietary needs than infants born at term, and mothers who deliver infants prematurely supply milk that is higher in protein and fat.

Micropreemies have critical periods of time for growth and development. There is new, key knowledge in these critical periods that we can and have learned from the preterm infant. By paying attention to these tiny creatures, scientists may also discover insight into medical conditions across populations. An article in *Newsweek* explains new research on how the placenta communicates important information to the fetus. The placenta has been, up until recently, a mostly ignored organ, but in trying to explain why premature births are happening more often, researchers began to study the neglected placenta. They found that the placenta sends developmental signals to the fetus in the form of chemicals, hormones, and gases. Sometimes, these signals won’t be
read by the body for years. Cutting off this communication early may mean that the body never receives certain signals. “Without the placental signposts, development is hobbled,” Anna Penn, a neonatologist at Packard Children’s Hospital in California says. “If we can figure out exactly what directions have been lost, we can chart an identical map and help keep development on course.” Two things they discovered: both progesterone, which helps nerve cells to grow, and oxytocin, which protects fetal neurons from becoming over-excited and dying, appear to reach peak concentrations late in pregnancy. In young children, low concentrations of the hormone have been linked to social and behavioral difficulties. The study of preterm placentas and premature babies who become autistic children may provide insight into the causes of autism in all autistic children.

You have never really thought about the way fish breathe before. You, computerless, (and even if computered, there’s no Wi-Fi in this wing) cannot Google “fish respiration.” You don’t know exactly how that baby is breathing inside you. Fetuses don’t have gills, as far as you know. The red blood cells in the baby’s veins are oxygenated with your breath, through the placenta that you imagine looks like a very large bag of haggis.

You wonder about the many ways you’re sure this is your fault. You picked up that heavy living room chair to vacuum underneath the other
day. You drove in the car over that bumpy road. You had sex, ate spicy food, slept on your stomach, walked three miles, slipped on the snow, ate pickles, ice cream, the pastry that compensated for the glasses of wine you weren’t drinking. You had an actual glass of wine. You ate garlic. You took a bath. You took a shower. You parted your hair on the left. It was all your fault, and now, suddenly, or perhaps just noticeably now, your baby, who is not able to breathe except in a very fishy way, dependent on magic and miracle to pull oxygen from the water, is going to be introduced too early to the very hard particles floating around in “room air.”

It’s human nature to save a dying thing. A veterinarian is called in for a pig or a cow, unintentionally wounded, even if the cow or pig is destined for slaughter. A little girl picks up worms that have been washed by the rain onto concrete and lay dying in the sun. She takes what half-moving parts she can and returns them to dirt. A woman swerves to avoid a chicken in the road. A man leaves dog food out for the elk after a hard winter.

A fetus born at twenty-three weeks sends into overdrive a human’s usual intent to keep humans alive. As of right now, although advances continue to improve the health of prematurely born babies, very few babies survive being born before twenty-two weeks gestation. Many doctors don’t think fetuses will ever survive born earlier than twenty-two weeks. Some don’t think they should. But the scientists don’t test
these boundaries just as an experiment. They make it because breath compels them. About ten years ago, Dr. Gary Chan, a neonatologist at the University of Utah’s Division of Pediatric Neonatology, was called to a delivery of a twenty-four-week gestation infant who was estimated to weigh less than two pounds. At that time, such a small, immature infant had a very small chance of survival. The infant was too small for their equipment. “We discussed this issue with the parents. When she was born, she required no assistance . . . she breathed normally! She weighed only 390 grams, one of our smallest infants who survived in Utah. She is doing well in Logan, Utah, and needs only glasses.”

Here, the one good instance—the miracle—became an exemplar for the rest. If one kid could survive on her own, then with enough doctors, enough nurses, enough researchers, enough money, enough patience, and enough time, maybe all micropreemies can survive. And few parents, especially if they know it’s possible for a twenty-two-and-a-half-weeker to survive, ever wonder if enough is too much. The individual hope combats the heavy statistics of despair.

To stop the contractions you have to stop everything. To stop time, you have to stop motion. You do not want this delivery to progress, so you suspend your disbelief that time-stopping is possible. The “you” here are the doctors. The “you” here is also the patient, and for now you have identical desires. If those desires diverge, you, the singular, will want to
get up to pee. You the singular will want to unhook yourself from the IV, since the IV is delivering the magnesium sulfate. The main thing magnesium sulfate does besides try to stop contractions is to make your skin feel like it’s covered with biting ants, which makes you want to leave the hospital, leave your bed, leave your skin, but you (the doctors and you) know you can’t go anywhere. You the plural know it’s best to lie down and take it. You the plural know not to complain, although the words going on in your head include motherfucker and who-did-this-to-me-in-the-first-place baby-blame, husband-blame, doctor-blame. What sadist even invented magnesium sulfate? But you stop. Stop yourself. You know it’s good; it’s for the best.

It’s the hooking up that ties you down. Once they have an IV in you, you may as well lie back and enjoy the view. Usually, the view is of a corner television, hanging just high enough and far enough away that you have to twist your neck to see it. The remote for the TV is the same remote you use to move the bed up and down, and sometimes you manage to change the channel to the most-basic-of-cable-network options, and sometimes you accidentally move your bed so far forward that you’re touching that stomach of yours, which you wish were higher or bigger, so that maybe they could give you a different drug that would get that baby out of there—thereby getting you out of there—but instead you let better judgment reign, knowing that you should appreciate modern technology and try not to complain out loud.
You were just on the verge of getting a handle on the fish, and then they bring in the pig. The magnesium sulfate isn’t working. The contractions are increasing. You are barely six months into this pregnancy and had, on Wednesday, finally bought the first maternity clothes you might need since your sister had given you some stretchy pants, which is all you’d really needed until then, and, it turns out, all you really need at all. No Motherhood Maternity shopping for you. Now they’re coming in with something called surfactant. Surfactant is made from calf lung or pig lung, beneficial for infants born at thirty weeks of gestation or less. The surfactant controls surface tension in the lungs, meaning that water that might stick won’t. The air sacs, underdeveloped and stuck to each other, aren’t supposed to inflate until forty weeks of gestation. They’re busy doing their fish-like conversion of oxygen to red-blood cells. But surfactant spurs the air sacs on, lets them open. They shake off their watery existence and exchange it for a non-watery one. Less surface tension. That sounds like a good thing, and yet you are nothing but tension. They regale you with a list of consequences if this baby is born now—respiratory distress syndrome, which the surfactant will help; a chance of cerebral palsy, which the surfactant will not; an aorta that won’t close; brain hemorrhages; sepsis. You don’t want to hear any more. You want to go home to your stretchy pants. You want to go back to being the protector and the nurturer. You want to make the lungs have less surface tension. You want to prohibit, with your folic acid taking,
any brain problems, including bleeding ones. You want not to know what cerebral palsy even is.

If there’s one thing pregnancy will teach you it’s that time does not go backward any more than gravity stops pulling, any more than knowledge unknows itself. Right now, gravity is pulling your baby down. You can feel your cervix. Unlike when giving birth at full gestation, you have the benefit of surprise to numb you. Your whole bottom half is lowering itself toward the ground without the help of a Craftmatic bed or buckling knees. Your body—and your baby—is on its own. You tilt the foot of the bed upward toward the TV, but not even that technology can save you.

In the United States, it’s almost always a bad time to be a pig. In 1989, it was a particularly bad time to be a pig in the world of neonatology. This pig did some charitable work. Eighty percent of the decline in the infant mortality rate in the United States between 1989 and 1990, can be attributed to surfactant therapy, states an article in *Science Daily*, the year in which surfactant therapy was introduced.

Who would think to look at the surface tension levels in the lungs? Only those researchers focused on helping premature infants survive. But the helpfulness of the strategy didn’t end there. A study involving nine infants with meconium aspiration syndrome, five adults with congenital pneumonia and one adult with respiratory distress syndrome, showed
that surfactant improved oxygenation in twelve members of the study. Like the study on the relationship between placenta communication and autism, the surfactant-slurping babies aren’t using all this research for themselves.

You, on the examination table, would thank the pig for its sacrifice if you knew about it, but you aren’t too interested in the problems of lung surface tension at the moment. At the moment, you’re just wondering who you can find to take you to the bathroom. You’re afraid to go alone. You’re afraid if you bend your knees to squat, you’ll give birth right into the toilet. The baby will slide out, too small for you to even notice. You don’t want to think that you’ve had periods worse than this.

Instead of taking you to the bathroom, the nurse brings you a bedpan. If a baby slides out, they’ll be able to catch it before it gets swept away into the drain like any tiny goldfish.

You wish you didn’t think so nimbly, so numbly, about such tiny things. There’s a problem. In the hospital, you can’t think anything except morbid thoughts. You think you’d be safe with all the protective coating around: white gowns dotted with tiny blue stars, plastic chairs, plastic tubes connected to plastic grommets connected to white hygienic-looking metal. And yet red thoughts creep in. You’re lying down but you can’t even pretend to sleep. An alarm down the hallway. Someone’s dying. Code blue, code blue. Everyone is turning blue.
You could also speculate. You can play word-association games—speculate, speculum—and wonder why the doctor won’t use a speculum to check to see if you’re dilated. When you ask, the nurse tells you about a study that shows that metal speculae infect birthing patients more readily than nooked and crannied, wrinkled and scabbed, butt-wiping and eye-itching fingers. Speculate, suspicious. How could metal host more microorganisms than a finger? They can sanitize metal.

Bodies are best for other bodies, you used to think. Your uterus is where the baby is supposed to live. It’s the best place for it. All the food and water the baby needs are pumped to the baby. The membranes between the outside world and the fetus are thick for a reason. They keep the bacteria and viruses out until the baby can build an immune system—until your body knows how to let the good ones grow on her eyelids, to keep them clean, and in her stomach, to digest food, and how to keep the bad ones out. Things will never be as ideal for her as in the womb, even if she is born on time. But she will not be born on time. She will be born today, just like you feared. She will be born at a time that was judged a miscarriage just a few years ago. Now, she’ll be called a micropreemie, and you’ll blame yourself, even if there’s nothing you could have done. She will be thrust into an environment that was not at all meant for her—bright lights, cold metal, thick plastic, dry air.

You have been trying to think about fish. Or, rather, you’ve been trying to think about fishy frogs—the way they begin as fish and turn
to fully animated frog lungs. Perhaps with enough of the pig fat, your baby could pump those fetal-lungs into the ballooning air sacs they are supposed to be. But when the contraction monitor starts blinking, all bets on positive visualization are off. If you were a landmass, and the belt around your waist was measuring seismic disturbances, the scale would be showing sharp peaks, close together. If you could equate contraction to earthquake strength, the fetal monitor would be showing an 8.8. When you later read about the Chilean earthquake that devastated the Maule Region of Chile, you will be reminded of the fetal monitor: 8.8 seems about right.

And so the scientists do what they always do when calculations top the charts—they intervene. “Natural childbirth” at twenty-four weeks is never natural. What set off this string of events is hard to say. Perhaps it was due to an amniotic-fluid infection. Perhaps it was due to congenital defects. Perhaps it was the fact that you tried so hard for two years to get pregnant, and whenever you try hard for something, even if you finally get it, it never stops being hard. You will always wonder what you did to make this happen. Perhaps future doctors will know why the mother’s perfect environment stops being a perfect environment, why your body would thrust your baby into the imperfect world. Whatever the reason, the doctors found that the baby was coming, and there’s no way to stop it now.
It was more of a slip of a fish than the push of a bowling ball. Your baby is born at twenty-four weeks, three days gestation. She weighs one pound, three ounces.

She looks like a baby in that she has two arms, two legs, a torso, a head. Ten fingers. Ten toes. But her skin looks alien—purple and covered with fine blond fur. If you lift her arm and peer at the hang of her armpit, the purple turns translucent. There should be more thickness between inside and out. The umbilical cord that had strung together a symbiotic relationship between mother and baby has been cut. Now the baby floats in the atmosphere without harness or host. Her skin, usually a first line of defense in full-term babies, is barely a membrane. Her lungs are closed rubber, tight as cord, thin as silk. Blow a spider’s wink of air and the sacs collapse like webs.

Part of you, the part that is curious more than the part that falls in love, looks at the baby, almost as red and worn and angry-skinned as are your hands from washing again and again just so you can see your baby and part of you wants to run away. But you stay and wash against the germs with the same commitment with which you ate the crackers you hated in order to fight nausea and keep that fetus fed. You now know that these little gestures do add up. This baby would have no brain if it hadn’t been for the hydrogenated fat in every Ritz cracker you ate.

She is specimen and fish and alien from beyond, but she adapts to this environment. The air sacs in her lungs, thanks to the surfactant,
inflated like tiny balloons, puff up thanks to a continuous positive airway pressure (CPAP) machine that presses that winkle of air in just the right amount of pounds per square inch (measuring more milligram than pound, more micrometer than inch). Her body responds to the heater, which keeps her a comfortable ninety-nine degrees when her internal thermostat cannot. A hundred different kinds of medical treatments have been invented for her. Drugs and surgeries to close her patent ductus arteriosus (PDA), a vascular connection between the heart and the lungs that naturally closes in full-term infants but sometimes fails to close in preterm infants. Ventilator tubes designed for very small esophagi are fed down her throat. IV lines with very small needles have been inserted into her veins, and very small feeding tubes have been laced through her nostrils, fed down the other pipe, into her very small stomach. She will be monitored for retinopathy, sepsis, bleeding on the brain, and necrotizing enterocolitis, where parts of the small intestine swell and die because immature intestines are more prone to infection.

Your baby was the perfect environment for the bacteria called *Enterobacter cloacae*. *Enterobacter cloacae*, in some environments, has the capacity to do a lot of good. It has been used in a bioreactor-based method for the biodegradation of explosives and in the biological control of plant diseases. Without oxygen, the microorganism can reduce selenite to selenium. Water becomes contaminated with selenite discharges from industrial practices such as fossil-fuel combustion, petroleum refining,
and mining. Selenite is soluble, toxic, and can bioaccumulate in the food chain, but, as noted by the MicrobeWiki at Kenyon College, *Enterobacter cloacae* reduces it to elemental selenium, which is nontoxic and insoluble. High levels of SeO₂ in water have been identified as the cause of both embryonic deformities and the death of aquatic birds.

In premature babies, neonatal infection with *Enterobacter cloacae* can be fatal. In the NICU, two cribs down—isolated, thank god, by Isolette, trademarked name for incubator, a premature infant was diagnosed at day twenty-one with *Enterobacter cloacae*. Five cerebral abscesses were discovered six days ago. They treated the baby boy with the antibiotics cefotaxime and amikacin. The nurses will switch to axepim and ciprofloxacin during the next four weeks, if he makes it that long (fingers crossed), until cerebral abscesses regress.

You do not want a baby with abscesses. When other parents walk by your baby’s Isolette in the nursery, you want to flap at them. Stay back, germ-carrier. You barely trust the nurses who are gowned and washed. Their hands are ravaged by the harsh soap and constant washing. Your own hands are starting to look like theirs. Road rash. As if you’ve been anywhere near a road since you checked in.

The doctors are concerned about your baby’s hydrocephalus. They tell you they might have to perform surgery to install a drain to pull the water from the inside of her head. You look at your baby. At the baby. Is
this your baby? Is this head so large because water plumps it large or is it large because your head is also large? She almost looks normal. Her face had looked almost as road-rashed as your hands. Now, days after her birth, it has turned as white as your niece’s had been the day after she’d been born at full-term. Big, water-headed baby. Here in the NICU, it’s always water. Washing your hands, fluids dripping through tubes, nurses and their big fat water bottles, sipping away from the babies, making you thirsty, you who forgot your cup. Too much water. No wonder you’re always thinking about fish. This whole state is too full of water. Maybe if you’d had the baby in Arizona instead of watery Michigan, this big water-headed problem wouldn’t be happening.

When you see a baby born at twenty-four weeks survive, and then you see, ten years later, another twenty-four-weeks gestation baby who needs some breathing help, who needs some surfactant, who needs PDA surgery and feeding tubes, how can you not give her everything medicine has? After seeing that girl survive with nothing, how can you not give more to this one?

Dr. Christian Yost tells the story of a twenty-five-weeker who adapted on her own. This baby girl was born right at twenty-five weeks, which just a few years ago was considered at the very limits of viability. After careful consideration and with tearful resolve, her single mother chose to hold her immediately following delivery rather than subject her
to the painful and invasive process of life support offered by the newborn intensive care unit. Her mother received counsel suggesting that even with full resuscitation the odds of survival without death or severe disability were close to zero. So this mother chose to allow her daughter to pass away in her arms.

The baby girl, however, had other ideas. After eight hours, and although her core body temperature was low, she was still vigorous, breathing on her own, and making sucking motions on a pacifier. At that time the care plan changed, and she was given the benefit of all necessary therapies and treatments to support her growth and development. Her NICU course was long, probably painful, and definitely invasive, but very successful. She has thrived under the care of her mother since then. On the day that she visited our unit as a teenager, she reported that school was going well and how excited she was to have just received her driver’s license.

You used to spend a lot of time at the lake. In Michigan, you can’t not spend time at the lake. When you were seven, you walked too far into the reeds. Your feet got soaked. You cut yourself on a reed. You could hear your mother’s voice calling you to come back, but you couldn’t feel wet or pain or even see your mother. Under your right foot, before you put weight on it, you felt something less than rock, more than plant. You lifted your foot. Underneath was the speckled round shell of an egg. You
didn’t know what kind it was. You bent over to look more closely at it. You wanted it. You knew you shouldn’t pick it up, but if you had been wet and cold and alone, you would have wanted to be picked up. So you put it in your hand. And there, you saw the hairline crack. What do you do with a cracked egg? You think of teacups you’ve broken and arms of dolls that have fallen off. You dream of Super Glue. You wanted the mother bird to flap its wings at you, to fight you off, to send you away. But there was no bird around.

You wonder if your baby is going to survive. If she does survive, will she be able to see? To hear? Will the water on her brain retard her? Will she be able to walk? These doctors opened the egg-shell and puffed air into this little bird’s lungs, but god, will she fly? You wish she would have stayed a fish just a little bit longer.

An easy argument against saving these babies: all this money for so few individuals, is it worth it? The amount of money spent per year in the United States alone on premature birth is almost six billion dollars. Let’s put it in perspective: three billion dollars have been spent on a recent attempt by the World Health Organization to vaccinate 575 million children. Another three billion dollars might eradicate polio entirely, even in Northern India where seventy-five percent of children remain unvaccinated. Those images of grown men rolling around on skateboards or carts because their legs have withered may disappear from our television screens entirely.
Six billion dollars could begin to dig into the Nigerian aquifer, one of the largest in the world, to bring water to people in a region where people die daily from lack of access to clean water. If you want to think locally instead of globally, six billion dollars could go toward curing breast cancer, one of the leading causes of death for women in the United States. Or think even more locally, and consider how six billion dollars could send every eighteen-year-old kid in Michigan to college for four years or buy 86,189 homeless people in Michigan a house (in Michigan). Six billion dollars toward premature babies adds up in the details. The book *Preterm Birth: Its Causes, Consequences, and Prevention* estimates the average cost of each preterm infant delivery and immediate medical costs in the United States is $51,600. But many births can end up costing millions over a lifetime. The direct cost for mental retardation can be $19,133. Physician visits; $3,513. Prescription medication; $30,151. Inpatient stays; $3,078 Assistive devices; $13,181. Therapy and rehabilitation; $54,185. Cerebral palsy, $83,169. Hearing loss, $23,209. Vision impairment, $32,058 over the duration of childhood. Expenses incurred when the preemie becomes an adult aren’t calculated in this study.

Costs were highest for extremely preterm infants, averaging $65,600, and for specific respiratory-related complications. However, two-thirds of total hospitalization costs for preterm birth/low birth weight were incurred for the substantial number of infants who were
not extremely preterm. Of all preterm low-birth-weight infant stays, fifty percent identified private/commercial insurance as the expected payer and forty-two percent designated Medicaid.

There are indirect costs, too, such as early intervention, special education, and caregiver costs, as well as lost productivity and labor in adults born prematurely who continue to suffer adverse effects. *Preterm Birth: Its Causes, Consequences, and Prevention* compiles these numbers to argue for more early intervention and education. The book argues more studies and more public outreach can help reduce these costs, but one can add up the costs. A twenty-three-weeker who is blind, has cerebral palsy, who has brain damage . . . well, the problem is, you won’t know how it will turn out until you go ahead and save the twenty-three-weeker.

But if you want to think very locally, you can think about a tiny baby. If that baby is born, gasping for breath, no matter whose fault it is, you should intubate. Not necessarily because the outcomes will be good, but because who knows how this one baby will respond? If you can do it, the logic goes, you probably should. If you’ve seen one baby breathe one time, how can you not give another one a shot? At Children’s Hospital Los Angeles, the nurses hung a photograph on the wall of a baby named Luke who had been born at twenty-three weeks. Because he was the earliest baby born at CHLA, they had marked his growth by inking and papering his foot every week. At twenty-three weeks, his traced foot was
the size of a bee. At twenty-eight weeks, the size of a quarter. At thirty-two weeks, it had grown as long as a double-A battery. They did this until he was a year old, when his foot had reached the size of a regular baby’s—about that of a mouse.

Although money is a common American gauge, it isn’t the only one. Dr. Susan Weidermeier, another neonatologist working at the University of Utah, notes that although babies survive, they live whole lives with debilitating effects. “I am not certain that they ever really ‘recover’ their full potential. We are only beginning to understand the consequences of the epigenetic alterations induced by development in the NICU environment. The ‘survival’-induced alterations of the human, preterm infant or other, do not come without a price.”

One mom I spoke with said that she felt there was always something wrong with her daughter, who was born at twenty-five weeks. “She just isn’t a normal kid. She doesn’t exactly fit in the autism spectrum, but when she’s in a crowded room, she just goes bonkers, bouncing off the wall.” I wonder about the placental communication. If there’s something the placenta plants inside a kid’s brain that says, Hey kid, stop being so loud that preemie babies miss, having been separated from their placenta at such an early date.

The question of how much to devote to one individual intersects with how artificial and abnormal humans have made our environment—
the NICU is an extreme version of how we adapt our environment to suit our individual needs. The question Dr. Weidermeier asks—what is the price of what we’ve created?—is a large one. When does the saving, at any cost, of the individual life—thanks to our amazing ability to replicate (but never quite be) the human uterus—stop trumping other concerns, like quality of life, direct and indirect costs, global inequities, and social welfare systems?

As Dr. Yost argues that we have reached a plateau for the limits of viability. He’s treated pre-term babies born before twenty-three weeks gestation. Each of them died. He believes that “until the next paradigm-shifting, technological adaptation, the current limit of viability should be respected.”

The earlier example he provided of the girl who succeeded miraculously suggests that if one twenty-five-week gestation baby can survive on its own without extreme intervention, then intervention on behalf of other (now twenty-three week) babies is a worthy endeavor. The limits are defined by those surprising babies. His philosophical questioning of how much humans should press those limits also makes sense. Humans can make things adapt to suit them, but it’s not always in their best interest. There are limits to adaptability. The baby’s lungs can learn to breathe with surfactant. Her body can warm in an Isolette. The hole in her heart can be repaired with microsurgery. With extreme
intervention, survival is possible, but perhaps a kind of survival that is sustainable. At some point “extreme” means everything. The nurses, doctors, and NICU are breathing for the baby, feeding the baby, warming the baby, cooling the baby, pressurizing the baby’s blood vessels, pumping the blood, keeping the eyes wet, keeping the skin dry. Everything is adapted for the baby. The baby adapts by surviving.

Can doctors keep every outcome in mind simultaneously? It’s not an entirely impossible request. Doctors remember many things at once—why not everything? Can a doctor imagine every tiny environmental shift that could be tried to increase the success rate of the preemie? Think of how we alter our environments ever so slightly, all the time. Your foot falls asleep. You stand up. You’re hungry. You go to the kitchen for a banana. The question for the individual eventually becomes the question for the many. In different environments, you do better. Sometimes you need to move from one place to another—on to the porch, back to the couch, to the car, to Phoenix, to Detroit, to Los Angeles—to do well. Sometimes you have to put on your glasses and see the dirt on the windows. Sometimes you have to take them off to see how clean things are. Sometimes you have to make adjustments to where you are. If you’re hot, turn the fan on. It ventilates.

Caring for preterm babies increases our understanding of the body’s ability to adapt in general as well as in the tiny specific. As the
study noted, the health care costs increase every week earlier a baby is born—meaning if doctors can keep the baby in utero one more week, costs can be reduced substantially. This is a good reason to continue to study micropreemies and a good reason to study prenatal health. But the repercussions don’t end with the individual baby. Some of the research that has been devoted to decreasing preterm infant mortality and increasing efforts to keep the baby in utero has led to other advances that contribute to the broader population. These aren’t even necessarily medical advances, but issues that run the gamut, from privatizing hospital rooms to complicating the abortion debate; from clustering care to mainstreaming special-needs kids; from women’s health issues being brought to the forefront to calling attention to the fact that more African American women than White women give birth prematurely, as do women in poverty as do women who live in air pollution or in countries without neonatal intensive care units. The intense focus on these micropreemies has led to larger understanding of both our own individual bodies and our collective national health body. Collectively, the country fell into a depression when John and Jackie Kennedy lost their 34-week baby. Conversely, we read with exhilaration about the successful vascular surgery on a heart the size of a cashew. The preterm infant is a phenomenon. An expensive, groundbreaking, heartbreaking phenomenon.
You look down at your baby. It takes a while to love any baby in the same way it takes a while to love any alien. It takes a while to love an alien who has had heart surgery, eye surgery, who was on a jet ventilator, who had so much plastic contraption between you and it that calling it *it* didn’t seem as cruel as it did accurate. But even twenty-four-weekers have hands. She reaches out to you. She curls her hand around your over-scrubbed finger, just like a regular, non-broken baby would.

The way the baby rubbed her tiny thumb against your index finger. The way she balled up her tiny fists, mad, even though she couldn’t make any noise on the vent. The way she looked up into the light and blinked at it—suggesting that maybe she, too, could see. The way she stroked the arm tied down to tubes with her other free arm. The way her ears curled like a snail’s. The way her belly pressed round as an otter. Her fingernails as sharp as any nails. She is fierce and lo, though she may have cerebral palsy, chronic lung disease, blindness, deafness, or, later down the road, a propensity toward adult onset hypertension, coronary artery disease, high blood pressure, her own struggles with infertility and premature birth—the amount of care that went into making that child live, the ways the fetus could adapt to living in such a plastic world, the kinds of adjustments and modulations, the sheer number of bodily processes that were done for her that she then learned how to do—she will be made out of these adjustments. She’s the sign of the everything you have ever had to think about at once happening simultaneously.
She’ll adapt, with a little help, thanks to a science that tries to understand what the womb is like in there and can make a virtual womb happen out here. And what you will be able to say about her is that she met the future head on, with a little help from the world coming out to meet her. In fact, she might even help all of us to understand what it takes to survive when thrust into environments we’re neither physically nor temporally prepared for. She embodies a microclimate; she’s lived in the most microclimatic environment of all. She’s staved off microorganisms and learned to grow good ones in her gut. She’s not so much a metaphor as an anecdote. An anecdote and a sign that signals the way minutiae matter.