

# Forever Towards One

MAITHREYI NANDAGOPALAN

## I. Three Dead

**W**e hold dance lessons in the village school computer lab, stacking the chairs against the walls because it's the only available room with sufficient floor space. This computer lab is wildly incongruous, utterly improbable; the minutes I spend here checking my email after school always feel a little like cheating. This is the village of Saragur, which might as well be known as the Middle of Nowhere, Karnataka, South India. It is a beautiful place, nestled as it is into the verdure of farmland, hills, and forest. After the frenzy of my first year in Manhattan, it is an idyll. Nevertheless, signs of destitution are everywhere, and the combination of poverty and bucolic beauty makes the presence of high-speed Internet seem absurd.

The organization I'm volunteering with for the summer began as a small clinic for the rural communities here, but in fifteen years they've built a hospital, an herbal medicine center, a tribal school in the forest, and a village school near the hospital—as well as this computer lab, where monitors glow in the shelter of mud bricks people here have used for centuries, and where a young volunteer from Silicon Valley offers lessons in an ancient classical dance form.

*Fifty kilometers away lies Mysore, the nearest city. I've been spending weekends at my great-aunts' house there. Poor roads mean a two-hour bus commute each way, but the variation from hospital cafeteria fare makes the trip worthwhile. Mysore is usually a peaceful city, even a beautiful one. Often overshadowed by its more famous cousin Bangalore, it has largely escaped the economic explosion that has clogged Bangalore's streets with traffic and widened the city's poverty gap. My great-aunts look on the political and social conflicts in other Indian cities with head-shaking pity and sanctimonious gratitude that Mysore knows better.*

*Not today, though. Today is different. Today, early in the morning, somebody left the carcass of a pig in the compound of a Muslim school. This is an act of inflammatory prejudice, as incongruous in this well-integrated city as the row of Dell desktops*

*amidst Saragur's fields. The toll for the insult will be exacted in human flesh. The violence, when it comes, will be Mysore's first outbreak in nearly twenty years. The city is tense.*

The monsoons have come late this year. They should have started before I came to Saragur three weeks ago, but instead they have held off, defying meteorologists' forecasts and farmers' hopes. The weather is muggy and oppressive, suspenseful almost. Gathering clouds and dense, humid air promise rain, but the heavens fail to deliver. Everybody is irritable; my students, utterly inattentive.

One boy in particular—a boy with a certain lopsided mischief to his smile that belies his gentle eyes—is manifestly not focused on learning the steps. His gaze is fixed, with the constancy of adolescent infatuation, on a girl across the room.

Her family is Muslim, and she comes from the opposite end of town as his Hindu parents. If this were a Bollywood movie, they'd grow up and fall in love, defy their parents, lead several improbably talented passersby through elaborate dance numbers, and live happily ever after. The way things are, this is patently unlikely. For one thing, neither of these children even remotely approaches the caliber of Bollywood backup dancers. More important, real life seldom approaches the tidiness of Bollywood dénouements. These two children will almost certainly marry within their own communities—marriages their parents will approve or even arrange.

*In Mysore, rioting erupts. I've avoided reading the news for the last three weeks, first because of limited Internet access, and second because it is a relief to ignore for a time the reports of war and recession. So I don't see the piece that appears in Frontline, the magazine associated with India's national newspaper, which offers "varying accounts of what happened after the carcass was found," but does not equivocate about the consequences: "Parts of Mysore burned in communal fury and three people died" (Sayeed 5).*

*It is as if people have compensated for the lack of violent weather with their own human violence. When monsoons start, a single drop of rain can transform within thirty seconds into a torrent, a downpour that drubs out a drenching drumbeat on the dry dirt. The riots have begun with a similar suddenness. When the city subsides into an uneasy lull, the death toll stands at one pig and three humans.*

My cell phone rings. It's my mother. I glance around the room, where few of the children are paying attention to me anyway, and decide it will do no harm to take the call. She's terse.

"Don't come this weekend. There've been riots." She briefly apprises me of the situation, and before I can ask adds, "We're all fine, but they might can-

cel bus service any second. Stay in Saragur.” She hangs up.

*Even in a city as peaceful as Mysore, it seems people can't forget a sixty-year history of religious conflict, which itself has roots in a five-hundred-year history of conquest and discord, permeated by lulls of collaboration and coexistence.*

I want to get online and check the news, and since I doubt the students will pick up any spectacular dancing ability in the twelve minutes remaining, I release them early. The boy with the mischievous grin rushes to pick up the books of the girl he's been watching, and I don't tell him about the riots. I don't tell him that a pig died on the steps of a Muslim school. I don't tell him that in Mysore, his people and the girl's people may not be able to forgive each other for the crimes of anonymous individuals. I don't tell any of my students.

## II. Tendencies Unproved

For my tenth birthday, as for many other birthdays, my gifts included a volume of logic and mathematics puzzles. That year, the book was Clifford A. Pickover's *Wonders of Numbers*, a collection of numerical curiosities and recreational math. The puzzles were framed by the adventures of a whimsical character called Dr. Googol, who looked like a cross between a cartoon version of Einstein and a cartoon version of a walrus.

I turned to a chapter based on a problem first posed by the mathematician Lothar Collatz in 1937. The problem deals with certain special sequences of numbers, which Dr. Googol refers to as “hailstone numbers”:

To compute a sequence of hailstone numbers, start by choosing any positive integer you like. If your number is even, divide it by 2. If it is odd, multiply it by 3 and add 1. Next, take your answer and repeat the rule.... Repeat this process for as long as you like. (116-17)

Of course, I immediately closed the book and tried it, choosing 3 as my first starting number. Applying the rule first to 3 and then to successive results, I wound up with the sequence 3, 10, 5, 16, 8, 4, 2, 1. At this point, I saw that submitting 1 to the rule would give me 4 again, locking the sequence into an endless cycle of 4, 2, 1, 4, 2, 1. . . .

*In Mysore, one dead pig catalyzed days of outright violence and weeks of lingering tension. It soon emerged that a prominent politician—a member of the Bharatiya Janata Party, India's Hindu nationalist party—had been attacked. No connection was claimed to the incident of the pig, but people drew their own inferences, and the rioting spread. Ancient grudges came to a boil that summer in Mysore, grudges that*

*had their roots in the country's decades-old Partition into Muslim-majority Pakistan and Hindu-majority India. Retaliation was the most obvious response for many. Not for everyone, not even for a majority, but the riots didn't need a majority. A single act of violence can set off an avalanche of bloody clashes, a cycle of repeated recrimination that is easy to enter but difficult to break.*

*The effect isn't limited to rival communities. My mother and I manifest it in microcosm. Sometimes we can't even last ten minutes in the same room without dissolving into a dispute. I don't know what makes us the way we are, what drives us to find the words best calculated to wound, but it's been this way almost as long as I can remember. And once an argument begins, what follows is simply a series of reactions—near-automatic retaliations.*

The next number I tried was 7. It too reached 1 and entered the repeating cycle, though it took longer than 3 had taken to get there. This was intriguing. I tried more numbers; each came back to 1 as well. I thought 27 might be an exception when it brought the sequence all the way up to 9,232, but it too eventually returned to 1, taking more than a hundred steps to get there. At that point I realized that trying every number by hand might not be the best approach, and picked up the book again.

I learned that this sequence forms the basis for a famous unsolved problem in number theory known as the Collatz Conjecture, which posits that every positive integer eventually reaches 1 and enters the 4-2-1 sequence. Mathematicians have found this to be true for numbers into the trillions, but no one has been able to demonstrate that the conjecture holds for the infinitude of integers (Pickover 117).

*Violence, conflict, and antagonism may not be certainties, but we drift back toward them with such reliability that it seems as if they are. We may not be able to predict with certainty when and where the next spate will occur, or how we will get there, but it would take a very naïve idealism to deny that we will get there eventually. Start by choosing any positive integer you like. Even Mysore, a relative epitome of peace and religious integration, could not escape its disintegration into discord.*

*We live our lives, it appears, according to a strange and unconscious mixture of chaos and consistency. My mother and I, for instance, can go for weeks without clashing, long enough that our concord begins to make me nervous. We never know how long this peace will last. We have not yet managed to completely evade a conflict. Are we capable of preserving peace without these periodic reminders of the alternative?*

The path to 1 clearly depends on the starting number, but the nature of this dependency is elusive. Graphing the number of steps each starting integer takes to reach 1—the “stopping time” of the integer—yields clearly visi-

ble patterns that nevertheless resist prediction or characterization. An eerily beautiful order emerges from the chaos—an order all the more alluring because we can't explain where it comes from.

*With me and my mother, it's usually something small that starts off our fights, a phrase that one intends to be humorous and the other takes to be hurtful or a look that conveys more contempt than it is meant to. It is never quite the same catalyst each time, but soon we are on a familiar script. It doesn't matter where we begin. Start by choosing any positive integer you like.*

### III. Five-Beat Rhythm

In the computer lab, I've almost finished teaching a short dance piece, which my students will soon perform in a small showcase. This particular one is set to five-beat measures, which form a quick, lively, sharply accented pattern. Bharatanatyam, the dance form I'm teaching, embraces complex polyrhythms. It's not uncommon for cycles of four to be superimposed over cycles of seven, only to give way—in a seemingly capricious manner—to sets of three or five, or some more difficult combination. The unpredictable syncope actually conforms to a highly structured order, but it can take the entire duration of a forty-minute dance piece for the full extent of its rhythmic coherence to unfold.

*My mother and I have our rhythm, too: an ebb and flow of enmity and friendship. It is a complex rhythm, spanning the years of my childhood and adolescence and also, most likely, the years of my mother's own rebellion against the dictates of my grandmother. We bring this history with us to each new confrontation. We judge and generalize, and our judgments and generalizations carry the traces of where we started this cycle, even if neither of us remembers it now. Like the rioters whose blows bear the weight of generations' grievances, we contribute with each sentence to a much longer progression. Our fights are unpredictable and erratic, but like the oscillations of a hailstone sequence, they are also cyclical and subtly ordered—and they always end the same way.*

I've spared my students most of the piece's complexity; all they have to do is count, *one two three four five*, as I tap out the accented beats with a wooden stick. The only difficult part I've left in is the ending, which consists of an accelerating exchange between the recorded drummer and my aspiring dancers. The drum line starts with a sequence that diverges from the melody line layered over it, and the dancers must replicate that sequence in their footwork. The music responds with a slightly truncated version of the same sequence, to which again they must reply. The lines get shorter and shorter

and faster and faster until each single strike of their feet follows hard upon each single beat of the drum, and then they converge in a frenzied, climactic flourish, footsteps falling with the intensity of hailstones.

*Our exchanges share the same accelerating pattern, the same well-rehearsed illusion of spontaneity, though unlike the virtuosic showcases between drummer and dancer, ours are antagonistic. Ironically, our words usually converge on the one-beat monosyllable where we ourselves diverge:*

*“Fine.”*

*“Fine.”*

*And it is anything but, because neither of us has really listened to what the other said—or, more important, didn’t say. Minutes later, I can’t even remember her words, only that she never seemed to understand mine.*

*Afterward, I do what I always do when I can no longer stand to inhale any more of the tension we have left suspended in the air: leave. I run, pounding out all my fury and frustration on the miles of patient asphalt, draining my rage through the cracked pavement, until the words’ disorienting rhythm gives way to a simple metronomic pulse, feet and heart and breath all aligning in the same unvarying cadence. No uncertainty. No change.*

#### **IV. Sweet Sixteen**

*An auditorium, dark; an audience, silent. A dim red wash of light makes the stage visible, and a brighter spotlight illuminates the dancer Priya Govind. I’m sitting in the fifth row; this is a gift from my parents in honor of my sixteenth birthday and my own upcoming dance debut. Govind’s dance brings to life one of the legends of an ancient, warring Tamil tribe. The women of this tribe are accustomed to sending their husbands and sons into battle. No strangers to violence and grief, they are accustomed to waiting, and to the knowledge that they may wait in vain. The piece begins with one young mother carefully garbing her son in his father’s armor. Young though the boy is, she sends him to take his father’s place on the field of battle.*

My mother and I stand across the dining table from one another. The table is where we’ve drawn the battle line. We have reached a momentary lull, but at any moment a verbal explosive might go flying across the table. At this point, I don’t remember what set off the argument. It doesn’t matter. Start with any positive integer you like. We always revert to the same eternally recycled set of grievances anyway. With each successive utterance, we say less and less but mean more and more, acting as if some sort of telepathy will fill in the omitted explanations. We do this so that next time we’ll each be able to say, “You should have known what I meant.”

*She is enraged when a messenger returns from the battlefield to tell her, mockingly, that her son has suffered the ultimate humiliation, an arrow to the back—a coward's death, which could only have been inflicted as he fled the fight in terror. She turns the messenger away in fury, snatches up a sword of her own, and sets out for the scene of the skirmish.*

I take a breath, steeling myself for the second volley of the verbal battle. Some irreverent part of my brain idly notices that her eyes are flickering almost comically from side to side, switching focus between mine. I set my gaze on the bridge of her nose. She waits in silence, refusing to make the first move, and suddenly the bridge of her nose seems to emanate such profound contempt that I can't take it anymore.

*She arrives at a scene of slaughter, where the dead are scattered indiscriminately about the ground. The battle continues, but she storms unscathed through each skirmish, only looking for her son. At last, she catches a glimpse of metal rising from the mud—and yes, it is her family's armor, as familiar to her as the contours of her husband's body and the high laughter of her son playing soldiers with the other children. When she turns over the body, she sees that the arrow protrudes not from his back but from his chest. A hero's death, not a coward's. His honor, and hers, have been vindicated. Her heart swells with fierce joyful pride—*

I know she loves me. I've never questioned that; she's my mother; she's physically and psychologically programmed to. So run the dictates of biology, and she, an ardent Darwinist, knows them as well as I do. But at moments like this, I can't banish the fear that she doesn't *like* me, that I haven't earned her respect, that if we weren't related by the incidentals of birth and genetics, we would have nothing to say to each other.

*—and then her heart breaks. Her son is dead. A few days earlier, he played childish games in their village. Now, sent too young to his first war, he is one more body on the battlefield. She dissolves into sobs that shake her shoulders, and I find that I'm shaking too. Her hands, though, are steady as she pulls the arrow from his chest, arranges his armor and weapons around him, folds his hands, and finally closes his eyes.*

Her move. She won't let me interrupt the litany of grievances, and I focus less on the words than on the sharp crescendo of her voice as she hurls questions at me that aren't meant to be answered. I'm not reacting to the content of her tirade anymore; the tone of her voice is enough to send sensations of frustration and futility snowballing into fury. At last she subsides.

*The music decrescendos, the lights dim, and we recall at last that this is a production, a performance, a pantomime. The battlefield and the boy's body were imagined. But I'm crying as we file out of the auditorium. It is the third time I've seen*

*Priya Govind perform this piece. I find it's the first time I can't forgive the young mother her moment of joy.*

I believe, for an awful moment, that my mother would love to see me fall, to see me fail. And if she ever did, I don't think I could forgive her.

## V. Eight Strips of Paper

She stands at the stove, watching a pot filled with water and vegetables. Many evenings find her like this, and the flicker of blue flames from the burner behind her is a familiar sight. But tonight is not like most nights. Tonight, the pot does not emanate the usual fragrances of turmeric and cumin, chili powder and pungent asafetida—the scent creeping into my nostrils is strong, certainly, but sulfurous rather than spicy. Tonight, I am perched on the counter across from the stove, from which I'd be summarily evicted if my mother were making dinner. The reason I am allowed to stay, staring fixedly at a pot of red cabbage that has yet to do anything, is that this cabbage will not be eaten. We're not making dinner. We're making pH paper.

*Eight years later, in a chemistry lab class during my first year of college, I'm trying to rekindle the magic of childhood kitchen chemistry demonstrations. It's difficult. I'm performing an acid-base titration, and university lab titrations tend to be slow and tedious. Acids are chemicals that, in solution, yield a high concentration of hydrogen ions; bases, conversely, yield very low hydrogen ion concentrations and can neutralize acids when combined with them. Acidity is measured on the pH scale, which usually ranges from 1 to 14, with lower pH values corresponding to more acidic solutions. Performing a titration involves calculating and measuring exact quantities of both the acid and the base, so that there is just enough of each to completely react with the other. What this means in practical terms is that I've been sitting for nearly fifteen minutes watching a basic solution drip milliliter by monotonous milliliter into an acidic one.*

My mother tells me that boiling red cabbage produces what's called an indicator, a chemical that changes color at a certain pH level. Most indicators only work over a narrow pH range, but red cabbage juice keeps changing color over pH values from 2 to 12. A piece of paper soaked in the juice can be used to approximate the pH of a large range of unknown substances. Tonight, my mother, who believes that a fun evening with her daughter must involve chemistry, has decided to make some pH paper to show me. Somewhat to my own surprise, I'm enthralled. She assigns me tasks that don't involve open flames, and I cut out eight large strips of paper meticulously enough, but my hunt for substances to test has me yanking open drawers and cabinets with

careless excitement. For once, my mother and I are enthusiastic about the same thing.

*The section on acids and bases in my college chemistry textbook says that indicators are added to solutions during titrations in order to make “the equivalence point (called the endpoint) visible through a color change” (Siska). For the most part, the titration I’m performing is profoundly boring, an excruciatingly slow mixing of two solutions with no apparent effect. But the moment of change, when it does come, is dramatic. A minute increase of volume achieves the correct pH, and with the suddenness of a monsoon’s onset or a city’s collapse into chaotic riots, the color changes. The once-clear solution is now a bright pink.*

Our strips of paper dry a lovely shade of bluish lavender, the color signifying a neutral solution, pH of 7, my mother says. I’ve collected things to test. Lemon juice turns the first strip pink (very acidic); a drop of bleach on the second leaves a spreading blotch of yellow-green (very basic). We test milk, tea, vinegar, spit, even a drop of my own blood, and we’re down to the last piece of pH paper when I knock over one of the bottles, sending vinegar sloshing onto the floor.

“Do you have to be so careless?” my mother chides, and instantly the mood of the evening turns sour. I flare up at the impatience in her voice, she takes me to task for my temper, and by the time we are through, the eighth piece of litmus paper has caught my tears. They don’t change the color much, as it turns out. They don’t change much of anything.

## **VI. Fourth Commandment**

She comes into my room late at night. We have had one of our arguments earlier in the day, and I pretend to be asleep, regulating my breathing with the self-control that failed to regulate my words a few hours before. She knows I’m pretending, and I know she knows, but since our arguments follow a script, our reconciliations are not permitted to diverge from the stage directions. We have repeated this scene almost as many times as we have repeated the conflict that preceded it. This is part of the cycle; the same rhythm that guides our clashes also brings us to these nights.

*Priya Govind’s dance ends with almost no dancing. She is seated, so there is no flashy footwork, and her hands cradle the imagined corpse of the heroine’s dead son, so there are no stylized pantomime gestures. The pathos of the scene condenses into the line of her jaw, proud and brittle and anguished all at once, and into her wide dark eyes. Those eyes alone could recount an epic. The music changes and slows, subsiding*

*from the tumult and terror of war into a quieter cadence. The mother begins to rock gently, almost imperceptibly, back and forth.*

*And then, as she must have done since he was a baby, she sings to her son, a soothing melody that becomes a melancholy dirge. It is her last lullaby.*

She puts a hand on my shoulder, I relax against it, and there is perhaps better communication in these gestures than in all the misheard words of the morning. Something about the periodicity of these moments, something about their symmetry, is captivating. Our conflicts are vocal; our forgiveness, silent. It's a temporary peace, a tenuous truce that may last a few weeks or a few hours, the silent space between accented drumbeats. Without the silence, the drumbeats would lack impact. Without the drumbeats, we would not be aware of the silence.

## **VII. Two People**

Our rhythm is more difficult than I have always thought. Its iterations and deviations, its cycles within cycles, are painful sometimes. But there is a certain reassurance in repetition, in the knowledge that these cycles will continue, in the knowledge that others will continue them after us. Like a dancer, we somehow need this rhythm. And like a dancer's left and right feet, we need each other to perpetuate it. The titration won't take place unless both acid and base are present.

It seems, sometimes, as if this rhythm has been composed beforehand, as if the course of our arguments cannot change, as if the outcome is inevitable. We have no more control over what we say than the hailstone numbers, each directly dependent on its predecessor, have control over the path of the sequence. Individual molecules of acid and base can't just decide not to react.

*I can't answer for the cycles of calm and conflict in Mysore, or in any other city or society. It seems that some sort of order exists there, on a scale too large for us to fully comprehend. There is something to be gained, though, from attempting comprehension, even if we don't achieve it, because the best dancers and drummers can improvise that final exchange, and molecules move according to probabilities, not certainties. And that uncertainty, that room for choice, is what allows us to create, even just in a single infinitesimal instance—create, and not simply follow, a pattern.*

## **VIII. One**

This is what we are, my mother and I, this strange blend of unpredictability and inevitability. It is because we don't know what the outcome will be,

because there is a tantalizing, terrifying possibility of divergence, that we are drawn to continue testing. Every argument is a pH test of our dynamic equilibrium, not to see how acidic our words can get, but to see whether we will once again be able to return to neutrality. Maybe we can't break the cycle. But maybe that's all right—maybe the cycle itself is more important. I can't characterize the order of our interactions any more than I can define the pattern of a society's oscillations between violence and peace. I can't fit these human rhythms into the clean modular arithmetic of musical theory. But I know that the order is there. Collatz was no stranger to the phenomenon of chaos begetting consistency. His sequence yields clearly evident patterns of profound and mysterious beauty, patterns that seem to spring from nowhere as if an invisible, inscrutable force were guiding the numbers into their configurations. Every number we test returns to 1, and yet there remains no proof that they will all do so. Again, we keep testing. And every time we come back to 1, every time my mother and I fight and reconcile, every time a city riots and recovers and learns, we contribute one beat to an increasingly complicated rhythm. We advance one move along a pattern of infinite and haunting beauty. And maybe, just maybe, we come one step closer to understanding unity.

---

#### WORKS CITED

- Pickover, Clifford A. "Hailstone Numbers." *Wonders of Numbers*. New York: Oxford UP, 2001. Print.
- Sayed, Vikhar Ahmed. "Disturbed City." *Frontline*. 18-31 July 2009: n. pag. Web. 20 Apr. 2010.
- Siska, Peter E. "Free Energy and Chemical Equilibrium." *University Chemistry*. San Francisco: Pearson, 2006. Print.
- Song from the Purananooru*. Perf. Priyadarshini Govind. CET Auditorium, San José, CA. 17 Apr. 2005. Performance.

82 - MERCER STREET