

Vandenberg · Gregor Hartmann

AFTERWARDS, WE COALESCE out of the fiery cloud and lie tangled, hearts pounding, skin sticking, bodies soft and soggy again. Blood pulses in Paul's neck, slower than mine, since his work keeps him in shape. I walk my fingers through his short black hair and he kisses my neck.

"Have you decided yet?" he murmurs.

"I'm still thinking about it."

"I wish you'd sign," he sighs, one hand gently stroking my shoulder blade. His big rough hand feels like an oven mitt on my back. His arms are hard and covered with tiny scars. Whenever we make love, splinters turn up in odd places. My carpenter is a piece of wood that needs a final sanding.

"I told you, I'm still thinking it over."

He stirs restlessly. "What's to think? You—"

I put a finger to his lips for silence. Warm breath on my hand. Please, no more. Not tonight. I get enough of that damn petition during the day.

I have it practically memorized. *We, the undersigned scientists and engineers, pledge neither to solicit nor accept funding from military sources.* An act of conscience, a plea for peace in a world hell-bent on war.

For me it's not that simple. Times are hard at my lab. Funding for our experiments has dried up, and the only new money on the horizon is military. When the Pentagon funds science, they do it right. Hard dollars and five-year contracts.

We, the un-signed scientists and engineers, lie awake in our night beds wrestling with dilemmas as big as houses and too dark to see.

I whisper, "Let's go camping this weekend."

"Yosemite?"

"Vandenberg."

"Where?"

"Down south. Vandenberg Air Force Base."

Paul's leg twitches and his hand stops stroking my back. I turn my head and his eyes are blurry question marks. Only four inches between our faces. Four inches can be subdivided into eight half-inches, or sixteen quarter-inches . . . Subdivided into a million points, a billion. Infinity in four inches. A frightening concept. No matter how close we come there's

still an infinity of points between us, for even two inches can be subdivided into an infinite number, as can one inch, as can one-half inch . . .

Until we touch.

My lab studies combustion. This is science talk for “fire.” I’m a junior researcher; this is science talk for “serf.” We burn things; then I comb the data and weave equations to explain what happened. Conduction, convection, radiation—heat flows in intricate red braids. A junior researcher puts in a lot of long days. Nights too. Some of my work is so complex I have to go in at midnight so I have the computer to myself.

Thursday night, while I’m waiting for my job to finish running, I take a sheet of graph paper and start listing reasons for and against signing the petition. I love to think on graph paper. Preferably white graph paper with eight blue lines per inch. The ultimate thought-tool, a net for catching subtle ideas. Two headings: + and -. Conscientiously I list thoughts on either side. I’m a mathematician; I have some vague idea of solving for m . An hour later I’m on page 3 and no closer to resolution.

Wad the paper, throw it away.

Climb to the roof. Wind from the Golden Gate presses cold and wet on my face. The Bay is dark pewter. On every side, city lights twinkle like data points. A sprawl of information, scattered on a hazy graph, dreaming of the eye trained to scan and transform it.

My heart says sign but my head says no. To be a true mathematician—not a junior researcher—means working on big challenging problems. At the combustion lab I’m practically a technician. Calculus, calculus, day after day. I want to climb the silver matrix into Hilbert space and never look down.

Will Paul still love me if I lend my brain to the Pentagon? My sweet pacifist carpenter. He was too young to protest Vietnam, but now through me he has the chance to build a barricade and take his stand.

Paul, my love, this is not between you and me. It’s between me and me.

Friday at noon we start south. Down 101, the Binary Highway. 101 in base two translates into 5 in base ten. Can it be coincidence that the road parallel to 101 is Interstate 5? Or is this a cryptic message from the California Department of Transportation?

Tooling south, Paul bugs me about the petition. Weapons work is im-

moral, he says. Unclean. My soul will wither, my spirit will darken. Take a stand for principle. Sign the petition!

Harping on morality gets on my nerves, so I give him a hard time about the useful spin-offs of military research. You want to talk morality, my dear? How about the goodies we got out of World War II? Radar. Penicillin. Computers. Rockets. Even the high-octane gasoline that propels us down this sunny highway was originally made for bombers. We argue from San Ardo to Paso Robles and neither of us budges an inch.

Paul considers himself a carpenter-philosopher. He reads ferociously. We met in the biography section of a bookstore. I was looking for something on Kurt Gödel. Out of the corner of my eye I watched a big rough hand choose a book on Gandhi. As it retracted with its book I turned to follow, my eyes travelling up a muscular arm to a broad chest and a pleasant smile. Followed by coffee, then curry, and annihilation of distance.

Near sunset we arrive at Point Sal State Park, a few miles north of Vandenberg. With his van we don't have to pitch a tent. We simply park beside the dunes.

Right away we break out the binoculars and observe our quarry. We could be spies, but no one comes to stop us. The base is a former artillery range next to the ocean. A red-orange metal tower embraces the missile, and a giant beige windscreen shields it from gusts. The missile! The first I've actually laid eyes on. At this distance it's a sliver, grey and white and vague in the evening light. Surrounded by the tower it's hard to see. It seems too frail, too tiny, to be the center of such fierce politics.

"I still don't understand what we're doing here," Paul grumbles.

"Research."

"Why? Who cares what a missile looks like? Did you read those clippings I left on the table?"

"It's not the same. I have to see it."

"You're being *irrational*," he gloats.

"One of the greatest triumphs of mathematics was the invention of irrational numbers."

I lean against the van, warm in my ski jacket, as evening folds the sun away and wraps it in purple.

To the south, Vandenberg twinkles.

Gather driftwood and build a fire.

Eat hot dogs. Drink beer. Stare at the coals, merrily combusting, radiating their warmth to my face.

Fantastic sky out here, on a dark coast far from cities. We lie on a blanket and gaze into space. Lots of satellites up there. A satellite looks like a loose star, a pinpoint of blue-white light, creeping across the sky, until it enters Earth's shadow and fades and vanishes.

I remember when satellites were rare. When I was a kid in Colorado the newspaper said when they'd pass over. Tiny print, next to the weather map. One summer night my brother and I went out to look, and when we finally saw one I felt something magic had happened, that I'd been granted a glimpse into a secret special realm.

When I took my first physics class I found more to marvel at. A satellite in orbit traces an ellipse. A pure geometric figure with the Earth's center of gravity at one focus. That is to say, ellipses weren't an arbitrary shape someone cooked up. They existed in nature! I lifted my head from the graph paper and looked at the chaos of the classroom, the desks at odd angles, blackboard slopped with trivia, students slouching like half-empty daypacks, and I felt happy, knowing that hundreds of miles overhead shiny metal balls wove a nest of perfect ellipses around my planet. Chaos below, order above.

I tell Paul. He understands. He says he feels something similar when he uses a chalk string to draw a line on a floor. Two carpenters stretch a string between them, pluck it once, thwack: a line. Dusty and vague and ephemeral, but nonetheless, the shortest straightest distance between two points.

Paul muses, "What is it about geometry that makes us feel this way?"

"Remember Plato? The physical world is an approximation of the ideal. A shadow of the ultimate, which can be comprehended only by the mind."

"Do you believe that?"

"Sometimes. Depends on what mood I'm in."

He snorts. "I think it's dangerous. You enjoy abstraction too much. You should be more down to earth."

I pat the sand. "Sea level. Can't be more down to earth than this."

"You know what I mean."

"Yeah. And I resent the way you put me down."

"I don't."

“Yes you do. You’ve been doing it all day. It’s OK for you to use abstractions. You nag me about morality and justice and history—all sorts of hazy words—but you dump on my math. How come it’s OK to use abstractions from politics but not from math?”

Paul sits up and throws another piece of wood on the fire. Sparks climb into the sky, tiny red stars swirling amid the white ones.

“Well,” he says finally, “I guess it scares me.”

“You have no right to be scared by how I think. It’s my mind. I’ll think as I please.”

“I know. Believe me, I know.”

Saturday morning. Bones cold and thick. We crawl from our nest of sleeping bags like bears in spring. The sea is gray and stiff and smells of wet salt.

When it warms up we lie on the beach. The sun weighs me down. One hundred ten pounds slowly sinking into the sand. Without a blanket to save me I’d probably sink out of sight.

Still, it’s nice in the sun. Working indoors all the time I feel like a mole. I have to be careful about the sun—redheads burn easily—but it’s worth it to be outdoors. The sun is pleasantly hot, but not so hot I sweat.

Lindquist has pale skin too. He’s a Swede, a tall thin knobby man with earnest Lutheran morals. Standing in my cubicle, urging me to sign the petition, he clenched his hands like a parson counseling a young sinner. Military money might seem tempting now, he warned, but in the long run I’d be cutting my throat. I’d have to get a security clearance, and once I had it I couldn’t work with foreign scientists. No more free exchange of ideas with my peers. He told me a horror story about a research team at Brookhaven that accepted military money. Their experiment produced more energy than they expected. Unbeknownst to them, they’d crossed a threshold that put their work into classified territory. The day before they were to deliver a paper at an international conference the military ordered them not to. Classified! Since they were dependent on that funding they had no choice but to swallow their embarrassment and humiliation.

Leading the opposition is Rossner, a short muscular Jew. A witty, wisecracking man of the world, who makes the Pentagon sound like a kindly uncle so rich he can’t keep track of his cash. Uncle has invited me to an exclusive new restaurant. I can dine at the head table, or I can stand outside with my nose pressed to the glass. The petition is a meaningless

gesture, since thousands of scientists have submitted research proposals to the Pentagon. Military money is flooding into Caltech, MIT, Stanford, Brown. The University of Alabama is gorging on Pentagon grants. Do I intend to sit on my thumbs while rednecks move ahead?

These practical arguments upset Paul. "Is that all you guys think about? Your resumes?"

"We're not children. It's hard to take a noble stand in the unemployment line."

"Rossner sounds like a slimeball."

"I think he has a point. Half the scientists in this country do military work. It's stupid to cripple my career for a quixotic gesture."

"Lindquist is signing."

"Lindquist is an old man who's made his reputation. I'm just starting out. Rossner says it's stupid not to grab some money before the priorities change and the funding dries up."

"Working for the military. Christ. It's hideous."

"Research is research. Once knowledge is created, it becomes the property of humanity. Anyone can use it for anything. The generals or Greenpeace—anyone."

"How can the good guys use it if it's classified?"

"It seeps out. It gets around. You can't suppress truth."

Paul snorts and stomps off up the beach. I lie back on the blanket and close my eyes. Paul's problem is that he believes in facts. His mind is a toolbox filled with facts he's pried out of books. Somehow he hasn't realized that for every fact there is an equal and opposite fact that cancels it out. Like positive and negative numbers. He throws pro-petition facts at me and gets mad when I brush them off. I may not know the counter-fact, but I know it exists, somewhere, so I'm not swayed.

Fact and anti-fact. One and -1 . The universe is symmetrical, my love. I stand at the center, wearing my Zero like an impartial halo.

After lunch we hike south, crunching on the hard wet sand close to the water. Flip-flops slap my feet, and bits of sand pelt the backs of my legs. We pop kelp bladders and stop to look at green rocks. Not many shells here. Waves must be too rough. Reducing complex spiral patterns to random calcium sand.

I empathize with the shells. The ocean makes me nervous. Something

about being on the edge of a continent, caught between big slabs of land and ocean and sky. If elemental forces slip out of balance I'll be crushed.

Paul's right at home. He used to surf. Walking on the beach, he nudges my hand with his. I hold his thumb, a little joke of ours.

Eight months I've known this man. Where do we go from here? Shall we live together? Or draw back to a safer distance? He has an image of us in which he is the worldly one, battling quick-buck contractors and city inspectors, while I dream in my ivory tower, a redheaded Rapunzel. The truth is considerably different. Politics at the lab are fierce and played for keeps. Idealistic Paul would last about two days, or become a Nietzschean. But he loves the myth of himself as my protector/mentor. Can I break the spell and still live happily ever after?

Hand in hand, we make a romantic picture, walking south on the empty beach. We could be a couple in an advertisement for Club Med—except for the missile base coming closer and closer, until we reach the perimeter fence.

Tonight's launch is a Titan 34D with a liquid-fuel main stage and two solid-fuel boosters. At close range it looks tougher, more substantial, better able to hold its own in a political hurricane. Cool and silvery in the afternoon light, it floats above the pad like a balloon, tugging at its cables, eager to rise to its rightful place in the heavens.

I called the base PR officer before we left. Since she wouldn't tell me what the payload is, we assume it's a spy satellite headed for polar orbit. That's Vandenberg's specialty: launching to north-south orbits. From pole to pole, like Santa Claus, the better to peer down Mother Russia's secret chimneys.

In the next few years there may be more than cameras going up through Vandenberg. X-ray and chemical lasers. Kinetic weapons. Things that shoot metal and energy and charged particles. Things that lash out across 8,000 miles of vacuum and break an ICBM like I'd snap a pencil.

Inside the cyclone fence the war in space has already begun. Vandenberg is (0,0) on the Cartesian grid, the point from which the missiles stream forth, drawing their curves like graceful quadratic equations.

Paul stands with his arms crossed, feet spread, glaring at the new Moloch. "Maybe you should do it," he announces.

His sudden shift catches me off-guard. "Why?" I stammer.

"Burrow from within. Learn secrets. At a politically sensitive time you

could blow the whistle and destroy the project.”

“It’s dangerous. I might be deluding myself. Suppose I came to like the work?”

He shrugs. “It’s a thought. Don’t you want to be the next Daniel Ellsberg?”

No, I want to be the first Barbara Marie Drennan. I touch the fence. The wire feels chalky. Salt, maybe? Or corrosion from the wet ocean air? A fence across a beach is a gesture of stunning arrogance. I hook my fingers into the fence and lean against it, pressing my cheek into a wire square.

“What are you doing?”

“Research.”

Wind vibrates the wire. Come to me, Vandenberg sings. Come touch my computers, come taste my secrets.

I close my eyes and see new equations sprout like linear trees, their fractal branches quivering into the sky.

On the walk back to the van, the constant wind gives me an idea. I plant our empty beer bottles in the face of a dune. The wind blowing over them produces deep foghorn tones.

Hiiiiiiiiiiiiiiiiiiii

Adding water to the bottles tunes the “instrument.” Every time the wind gusts harder the bottles moan in a higher key. Soon we have half a dozen bottles scattered across the dune, each brown glass cylinder singing a demented song to the ice plant.

Hooooooooooooo

Gleeful, we sprawl in the sand, working on two more beers for the greater glory of music.

Paul looks at the ocean and says to no one in particular, “If you accept military funding, people will call you a fascist.”

Pleasure drains from the afternoon like a rock losing color as it dries in the sun. Fascist? They sure will. San Francisco is a liberal town. When the combustion lab was working on woodburning stoves I was a hero. Alternative energy—death to Exxon! If the lab switches over to military work I’ll be shunned at parties. I’ll have to cross picket lines to go to work. I’ll come out to the parking lot and find people I know from the Co-op splashing blood on my scooter.

Paul sees by my bleak look that he's gone too far. "I'm sorry," he says.

"How could you say such a thing?"

"I said I'm sorry."

"You called me a fascist."

"It's an important issue. I want you to make the right choice."

"No, you want me to make your choice."

"That's not true. You're being illogical."

"Don't speak to me of logic. You don't know the first thing about logic, you carpenter."

He turns red. I jam my bottle into the sand, grinding out rage, hurt, bleakness.

"Look. Why don't you find a job where you can do pure math, not the applied kind."

"Why?"

"So you don't have to work for goons. So your hands are clean."

"It's not that simple. Remember what I said about knowledge flowing from the military to the civilians? It goes the other way too. Look at Karmakar's algorithm."

"What's that?"

"Karmakar works at Bell Labs. He found a mathematical shortcut for solving complex problems. It'll help solve all sorts of computation-intensive equations. A beautiful piece of math. The military's going to use his algorithm to manage data in computer networks under nuclear attack. It's quite a challenge, getting reliable information out of a network whose shape keeps changing because the nodes are being destroyed."

"That's terrible," Paul says. "Can't he stop them? Can't he copyright it or something?"

"Copyright a piece of math? That'd give 'em a good laugh over at the Library of Congress. You can't copyright a law of the universe," I jeer. "It happens all the time. Doing 'civilian' work doesn't guarantee the military won't use it somewhere down the line. The only way to have 'clean hands' would be to stop doing science. Go be a bookkeeper or something. Think your boss would hire me? I could count nails in base two."

Paul has no response to that. He stares out to sea, the bottles around us singing their mournful song.

Night. Cold wind off the land. We turn the van so the side door faces the launch pad and huddle inside.

Paul brought a shortwave radio. We tune to the frequency used at Vandenberg.

The floodlit missile glows on the pad like a crack of light in a cathedral door.

We talk about travel. A trip to Hawaii, maybe? We know our subject — airfares, condo packages — but our words bounce off each other. The petition has come between us. Like a mathematical plane: thinner than paper but stretching to infinity, dividing the universe into two separate realms.

In the dark, we're disembodied voices, anonymous as callers on a late-night radio show. Stars swirl overhead, white holes in the sky. Heat radiates from them, thinning out according to the inverse-square law, until only a wisp of heat reaches Earth: a thin weary infrared mist sifting down over the grey cold beach.

"Barb?"

"Mmmm."

"Are you still mad at me?"

"Uh-huh."

"I said I was sorry."

"I heard."

Cold wind shakes the van.

"Are you going to sign?"

"No."

"Can you tell me why?"

"No."

"Do you even know why?"

"Yes. Get off my case, damn it."

Our faces are vague and amorphous in the night. Our features change and swirl. Who will we be next? I tense for an attack, but Paul looks down, looks away.

On the pad, the Titan glitters. A cluster of concentric cylinders, pure math condensed into metal.

At 10:17 P.M. the range safety officer warns planes to stay clear.

Time passes. Two brief holds.

Nineteen. Eighteen. Seventeen. Sixteen. . . Pythagoras thought numbers had shapes, which is why we still refer to “squares” and “cubes.” Listening to the countdown I know what he meant. I can see integers like billiard balls, each a different color, plopping one by one into a vast flat sea.

At Four, the base of the rocket catches on fire. Smoke surges and fumes and flees the bright fire.

At Zero, thrust overcomes gravity. Leisurely the Titan creeps up the gantry, building a fiery column. Slowly at first, then faster, the rocket keeps its promise to the sky.

(All this in silence. A TV rocket roars and rumbles, but this one is silent. Either we’re too far away, or the sound is masked by wind and surf.)

The ball of light arcs out over the ocean, its vapor trail glowing in the starlight, as the Titan draws a chalky smear across the night.

Two minutes after lift-off: a flash, a wider puff of smoke. Boosters off, the radio informs us. The rocket is shedding mass, consuming its body, all energy concentrated on the tiny payload clenched in its teeth.

A new star slowly rises, hesitates, and appears to fall to the southwest. The rocket is so high it’s going into orbit around the curve of the planet. Tracing an ellipse, one focus at the center of the Earth, an ellipse as perfect as Euclid’s last dream.

When it drops below the horizon I return to my body and realize I’ve been biting my lip, praying nothing goes wrong and the engineers don’t have to blow it up and waste that perfect arc.

“That was lovely,” I sigh, feeling lighter, as if a piece of me has been lofted into orbit, to ride the ellipse like a frictionless pearl.

Paul says nothing.

I look at him. He wants to be stern, but I can see that despite himself he’s impressed. Even though it’s not politically correct, he felt the rocket’s power.

My gaze challenges and pleads.

Finally, Paul lays his thumb in my palm. I squeeze it with an unbreakable grip.

On the wind: a whiff of rocket fuel, an incense potent across the miles from Vandenberg.