Plastic: an autobiography

ALLISON COBB

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PLASTIC:
AN AUTOBIOGRAPHY

ALLISON COBB

ESSAY PRESS EP SERIES

#35

ESSAY PRESS EP SERIES

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INTRODUCTION

It started with an irritant, like a splinter, or an itch. In my work for an environmental group, I kept encountering snippets of news about the extent of plastic contamination around the planet. Each one stuck into me, a little hook. I heard about the mass of plastic swirling at the center of the Pacific. I read about a dead albatross chick filled with plastic bits, one dating back to World War II. I learned about plastic shards in Arctic ice cores, in the bodies of lugworms, in the deepest sea canyons, and in every single sample of the top ten brands of German beer. I learned about plastic chemicals in people's bodies (a U.S. government study found nine of ten people carry constituents of plastic inside them) and that babies come out of the birth canal with 232 industrial chemicals already circulating through their bloodstreams.

Each little painful prick of knowledge accumulated in my brain and in my body. One day, talking with my friends Kaia Sand and Alicia Cohen about our work, about our writing and its problems, I blurted out "I'm going to write about plastic, an autobiography." I didn't really know what this meant. But I had some

sense (because plastic is so ubiquitous, everywhere out there and also inside me) that I could probably uncover a direct link between my body and the plastic inside a dead albatross chick some three thousand miles across the ocean. If I could do that, maybe I could also draw the net wider. I could see how wide, how far, how long I could stretch this net connecting my own body to this substance: plastic, which barely existed one hundred years ago and which now is so amorphous, so omnipresent, it seems to disappear if one tries to look directly at it.

Collected here are some of the results from four years of research. I followed the connecting threads through startling terrain. I thought if I could do this work, if I could trace these threads and how they intersect, and bring them into high relief inside a piece of writing, then I might—what?—find some answers. About how to exist now on a planet that seems to be dying, smothering beneath the outputs of human technology.

I failed. I have no answers. What I have is just astonishment: at the intricacy of the net, its infinitely intertwined connections wound across the earth. Anything alive could write this book. As it turns out, the autobiography of plastic is the autobiography of everything.

PLASTIC

WORK

I found a way to make it work.

That's what Stan Ulam told his wife Françoise one bright winter noon in 1951, when she walked into the living room of their house in Los Alamos and found him staring out the window.

"What work?"

The mathematician turned his eyes to her.

He turned his eyes to her.

His eyes.

I have tried to figure out what they were like. I have studied the photos, most black-and-white. So flat. They can't tell anything.

His friend, the mathematician Gian-Carlo Rota, said what they were like: "He looked at me, his intense blue-green eyes popping and slightly twitching

(they were the eyes of a prophet, like Madame Blavatsky's)."[1]

But this also seems to fail. The words themselves create one mask, I guess, the grandiose comparison another.

The word prophet is ancient Greek: one who delivers messages from gods. Medieval Christian writers suppressed the Latin word for prophet—blanked it, scraped it out—because it breathed a pagan breath. They inscribed instead the safely dead Greek.

The Latin they reserved for poets. *Vates*. It comes from an ancient root that means "to blow into, inspire." As in: entered by a spirit. The Norse god Odin sprung from this root, as did the Old English word "wood," which means insane.

What has died—a language, a person—can be shaped into anything. A mask to suit the purpose. Is that accurate?

I meant to write something brisk, concise. But this has taken me far from Stan Ulam's eyes.

I could write to Claire, Ulam's only child. Rota says the girl would "browbeat" her father and "cut him to pieces at regular intervals." But Rota spun other myths about this family.[2]

Claire Ulam would be about my parents' age. Born of the war. She and I share a birthplace—Los Alamos.

I could start with that. But what would I ask? A single question, concerning his eyes?

What can be said: he turned his eyes to her, Françoise, his wife.

This is her story. She typed it into the back of his autobiography as a postscript to his *Adventures*. She called it "engraved on my memory."

No, it can't even be said he looked at her. She didn't say so. I imagined it. Maybe he continued to stare, as she wrote, "unseeing," out the window.

"I found a way to make it work."

"What work?"

"The Super," he replied, by which he meant the new bomb, thermonuclear. "It is a totally different scheme, and it will change the course of history."[3]

STORY

Ensign Elwyn Christman piloted his airplane through a moonless night over the ocean, the cockpit illuminated by the phosphorescent hands of the instruments and the flickering light of the exhaust stacks. He hunched inside his wool flight suit against the cold at twelve thousand feet.

The date: December 27, 1941. Christman. The name so filled with portent. Then, Elwyn. It must have seemed an odd name, foreign. It is Gaelic, or Welsh. It means white and fair, holy. He went by Chris to his friends. To his mother he remained Elwyn.

On this night, Christman's commanders ordered him and his crew to fly eight hundred miles and bomb Japanese warships at Jolo Island in the Philippines. They flew in formation with two other planes. Another group of three flew nearby, all without navigation lights, invisible in the dark.

I know what it was like inside the cockpit because of another man on that mission: Joseph F. Long. His nephew saw my query on a veterans' Listserv, and emailed his uncle's journal entries.

Long's handwriting is looping, elegant. He recorded details the others didn't. He wrote: "The cockpit is illuminated by the phosphorescent hands of the instruments and the flickering light of the exhaust stacks." He wrote: "No moon" and "The big dipper is upside down off our starboard bow" and "I sure hope they're there when we arrive," meaning, I suppose, the Japanese.

Long disappeared on a mission two months later.[4]

War leaves mostly gaps. But that sounds too clean, doesn't it? Raw, jagged, taking blood from each birth that has to pass.

How to cross to Christman, a once-living human?

More than others, he left a trace. Because he was a minor leader—a "junior officer" in military speak—in charge of his own airplane. And because of this mission, which they told, and others retold, so it became a story.

The PBY airplanes they flew they called "lumbering," slow and heavy. Meant for patrol, not combat. They were supposed to be escorted by fighters. But here is history: the Japanese destroyed nearly the entire U.S. fleet at Pearl Harbor then moved on, wiping out bases across the Pacific, forcing the survivors back fifteen hundred miles across the ocean. There

were no fighters left. Of the six planes sent on this mission, two would come back.

I have Christman's own words about what happened next, typewritten as an official report to the Commander-in-Chief, U.S. ASIATIC FLEET. I received it in the mail from the federal government, for free, as the letter told me, "due to the small number of pages."

I have no way to know whether Christman typed the report himself, but I can picture him in rumpled khakis in a sweaty, tropical barracks pounding on an old typewriter. The image comes in part from black-and-white World War II movies, in part from photos sent to me by his son. Christman, age 26, dark hair slicked back, dark eyes, deep cleft in chin, dark moustache, thin.

Whoever typed the report made several errors and didn't bother to fix them. The idiosyncrasies of the machine left their mark also—the B has a hitch in its curve, which makes the word "bomb" seem to waver on the page. Christman kept emotions out of his account; he reported just the facts, which means "the thing done," what happened. Most history books quote the version that Christman and his copilot Bill Gough told the American war correspondent Cecil Brown a few weeks later.

Christman brought his plane over Jolo just at dawn. He didn't realize they were under attack until he heard his machine gunner firing. Japanese Zero fighters. Christman zigzagged, trying to avoid them.

He watched bullets pour into the cockpit, smashing the instrument panel. I imagine this detail in slow motion, a movie, every sense narrowed to that.

The Zero pilot came close and fired his 20-millimeter cannon. The shell entered the cockpit just above Christman's head. He ducked, he said, by instinct. The canon punctured the fuel tanks in the wings, and gasoline poured into the plane. A second cannon exploded, igniting the fuel. Christman's copilot turned to look back into the plane. All he could see were flames.[5]

ZERO

The old Greeks had no concept for zero. They looked at the universe and saw numbers. The big secret that Pythagoras hoarded, the key to it all, resided in numbers' relation to one another, in ratios. Greeks found the same ratios repeated everywhere: in music, in planetary motions, in flowers. They considered this beauty (all things poised in a balance) and worshiped it. But ratios cannot be made with zero. Zero consumes all relations

and spits out

what

Chaos

which for the Greeks signified a kind

of absence

without form

or limit—

A weak word,

Chaos, it comes from gape,

just the opening of the human mouth. Zero,

weak also, just

empty place, then

wind, nothing.[6]

NOTHING

What can follow?

It silenced me for some time.

I ended the poem with nothing, then found I could not put a mark in the white space that followed.

Try this: dwell a bit in that gap. *I rang the doorbell of nothing there* – Alice Notley.[7]

No

The tiny word intertwines two roots. First the "n" sound *ne, na*. It seemed always to signify absence, a lack. Perhaps that's the tongue pushing out from the mouth. Away, not here. Then the round-mouthed *aiw*: vital force, long life. It echoes also through *aye* and *yea*.

I am the *no*

and the *yes*.[8]

So this: the dead albatross chick

on its back in the grass. A knife slides

inside its white feathers. *Mercy floated towards me, towards*

the door not there.[9]

The cut reveals a black cylinder of plastic, a bottle cap, a toy top.

Plastic erupts from inside the chick.

THE THING

The thing turned up in a corner of the yard, just outside the fence. I found it when I went out in the afternoon to take Quincy for a walk. Curved and black, plastic. Four feet long, a foot at its widest. I thought at first it was a car bumper. I put it in the grass in front of the porch. The next morning it was still there. I sat next to it in the sun and looked closely.

I was thinking of Heidegger, his essay called "The Thing." He writes that distance disappears and all things come equally close because of technology. In 1949 he meant airplanes, the radio, TV. These inventions bring everything before us in image and sound: ancient Egyptian pyramids, a cat in Japan, glaciers shearing off into Arctic waters. Things congeal around us—the uniform distanceless.

But this does not make anything present. The only way to approach a thing, to bring it near, is by sidling up to it, by thinking around, or through, what appears obvious. He performs this kind of meditation on the "thingness" of a clay jug.[10]

So I thought of meditating on this car part. It has a smooth surface, shiny. One side is flecked with light splash marks from mud or paint. It forms a complicated shape, wide at one end and tapered at the other, with holes and slats and ridges all along its length. The widest end contains deep score marks, some scratched all the way through the plastic. It is stiff but still pliant. Without the car body to hold its curved shape, it folds in half like a wing at its narrowest point.

What I see is the albatross carcass bursting with plastic. I don't know why I put that image in the poem "Nothing." I am the *no* and the *yes*—a line I stole from 'Annah Sobelman's first book. It has lived in my mind for years: an itch or splinter, contaminant. In the poem, Sobelman follows the line with a qualifying phrase. She narrows it, makes it domestic. I want the raw declaration, hanging there on the turn of itself:

I am the *no*
and the *yes*

So this: the albatross filled with plastic. Is it part nothing because it's dead, the door not there? Maybe. More, it gives rise to a no. It is ugly, a painful image. I want it to go. But it persists. It pierces the uniform distanceless of my life, like the *no* and the *yes*.

THE MARINER

Heidegger asks a strange question: "Is not this merging of everything into the distanceless more unearthly than everything bursting apart?

"Man stares at what the explosion of the atom bomb could bring with it. He does not see that the atom bomb and its explosion are the mere final emission of what has long since taken place, has already happened. Not to mention the single hydrogen bomb, whose triggering, thought through to its utmost potential, might be enough to snuff out all life on Earth. What is this helpless anxiety still waiting for, if the terrible has already happened?"[11]

Once I heard my mother's father thank my father, the only one to ever get a Ph.D., for going to work at Los Alamos. He said he was grateful for the atomic bomb because it meant he didn't have to invade Japan. He stood in his sailor blues and watched from the deck of a ship in the Bay of Tokyo the signing of the Japanese Instrument of Surrender.

Samuel Taylor Coleridge was not a sailor, and he never saw an albatross. Wordsworth claimed he gave his friend the idea for *Rime of the Ancient Mariner* after reading a journal of sailing around the world by Captain George Shelvocke. The captain recorded that one of his sailors shot a black albatross that for days had followed the ship.[12]

When the sailor kills the bird in the poem, every vital force seems to fade. The winds stop, the ship stands still, the world falls silent. Only a bloody sun burns. The others hang the albatross around the sailor's neck, but the real curse is this: the mariner lives while everyone around him dies.

Each turned his face with a ghastly pang,

And cursed me with his eye

It becomes a world of corpses. Even the sea rots. All that breathes is monstrous.

And a thousand thousand slimy things

Lived on; and so did I.

Coleridge published his poem about a hundred years before Heidegger was born. When Heidegger looked around at the twentieth century, he described something like the mariner's nightmare: corpses in a world of corpses. He had this idea that living under the sway of technology endangers people's relationship to all that exists. It reduces everything (objects, animals, people, even oneself)

to a stockpile of useful traits: labor power, money value, explosive force. As a result, everything dies. That is why Heidegger saw the hydrogen bomb as "mere," only the logical extension of this state.[13]

In the car on the way home from my grandfather's funeral, my aunt revealed the following: when she was a teenager, a man came to visit who had served in the Pacific with my grandfather. As soon as my grandfather was out of earshot, this man reported that my grandfather had saved his life. They somehow got separated from their ship and marooned on an island. Two Japanese soldiers attacked. Armed with nothing but a knife, my grandfather killed them both.

Norm. Norman Isidore Olson. Son of Swedish immigrants. He worked his entire life after the war at Woodward Governor, a factory that made airplane parts. The governor regulates the speed and power of a motor. My grandmother said that when he got back from the war he had nightmares, screams yanking them both from sleep. She said this as if it were something dark, a secret. He told her it was hard to spend all day inside the factory after so long on the open water.

I asked him once to tell me about the war. He told me this: his bunkmate on the ship always ate his ice cream first because, as this bunkmate would say, life is short.

The other night, my mother declared over dinner, "Your grandfather worked for an airplane factory so

he was exempt from the draft, but he considered that wrong, and he volunteered." My mother holds her father in a saint's light. "Mom," I said, "I thought he volunteered for the navy because he didn't want to be drafted into the army and turned into cannon fodder. "Ohhhh," she said, drawing it out, "you're right." "He worked in a sewing-machine factory before the war. He made the cupboards that hid the machines," added my father.

What I remember: he was enormous, six-foot-two and broad, with a high forehead and a combed-back sweep of grey hair. Blue-eyed. Sweet and kind. He liked most of all to sing popular songs from his day and old spirituals like "Swing Low, Sweet Chariot" and "Were You There When They Crucified My Lord."

Sometimes it causes me, to tremble, tremble tremble

He cut a few records with some buddies back in the '40s. My uncle found them in the trunk of my grandfather's old car. No one wanted them but me. They were scratched and brittle, pre-vinyl, the black shellac in places peeling off. I gave them to my sister, who is a musician, hoping she might find some way to translate them into a medium that would let us listen. At some point, she or my mother threw them out.

It has been more than a decade since my aunt told her story, and it all happened in the haze of post-funeral. My mother doesn't remember it, which

makes me wonder if my aunt really did tell us. I'm afraid to ask her now, just like they were afraid to ask him then.

We won't get them back. My grandfather, gone where the dead go. Into ground, certainly. The records. I can picture them, grooved surfaces melting off beneath a mountain of junk at the Los Alamos County Dump.

CAR PART

Heidegger would not consider the car part, an object of technology, worthy of meditation. But since everything has already happened, I decide I will press forward with the attempt. From studying its shape and looking at my own car, I decide it is a liner for the inside of the fender. The word fender is short for "defender," and it first referred to a piece of woven rope that kept the hull of a ship from smashing against the wharf. People added fenders to early cars because fast-turning wheels tossed up dirt and stones hazardous to other cars and people.

The fender liner acts like a shield. It keeps dirt and water out of the engine and deadens the impact of stones striking the body. It is curved like that, shaped like a shield, for protecting. The fender liner has an aesthetic function also. Matte black, it gives the base of the car a finished look, maybe not something you even notice as your eye runs over it, just a smooth surface, something pleasing, complete.

It fulfills, in a small and specific way, two needs, this piece of plastic: for protection, and for beauty. Not the beauty that Pythagoras admired, arising from a harmony of parts. This is beauty as a mask for something ugly. It covers the car's raw metal underbelly, which betrays its brute machine birth and pierces the illusion of speed and ease the shining surfaces impart. Plastic—the perfect cover—indeterminate, no whiff of industrial blood on it, featureless, flawless, eternal. It draws by this into itself each object, each

instant formed to

sate such

ancient

lust: to guard,

and soothe,

protect. Or,

more basic, just

that longed-for

state:

a peace

at rest, accordant.

Right?

THE ALBATROSS

The albatross filled with plastic suffered. Susan wants to make sure I understand this.

She has invited me to her office in the basement of the California Academy of Sciences below the grounds of Golden Gate Park. The basement serves as resting place for twenty-six million plants and animals. Specimen. The word comes from the Latin specere, to look at. This basement also houses artifacts (which are things made by people) and scientists carrying out the academy's mission: *to explore, explain and protect the natural world*.

Explore, explain, protect. To boldly go. But Susan Middleton is not a scientist. She's a photographer. She worked with Richard Avedon, and is known for using the techniques of fashion photography (dramatic lighting, stark backgrounds) to make portraits of plants and animals—intended to reveal the character of each individual. Her images strive to create for viewers what she calls a direct encounter.

Susan recently photographed the Academy's collection of specimens for a book called *Evidence of Evolution*. Mostly, though, she takes portraits of living plants and animals. In 2003, she and her colleague David Liittschwager traveled to Kure Atoll in the Northwestern Hawaiian Islands to document the birds and plants and sea creatures there.[14]

Hawaiians call Kure "the elder," says Susan. It is the oldest of the Hawaiian islands, moving like all the others slowly northwest on the Pacific plate, eventually to disappear beneath the water.[15]

In fact, Kure the island is already gone. The atoll represents the submerged mountain's coral remainder, just the skeletal base of countless translucent creatures eroded over time to fine sand.

The photographers almost didn't get there. At fourteen hundred miles northwest of Honolulu, Kure is, from the human point of view, the most remote atoll in the planet's most remote island chain.

For the albatross, Kure is one of the few places on Earth it comes to rest. The bird spends its life in flight, ranging over thousands of miles of water, sleeping and feeding in motion, landing only to breed on specks of ground surrounded by a liquid horizon.

In-spire. The albatross is filled with air—tiny sacs pack the vault of its ribs, curving around its organs and extending through the narrow bones of its wings

that span six feet, eight feet, eleven, the longest of any creature.

Flight. That's not the right word. The albatross glides. Its shoulder and elbow joints lock into place. It avoids the muscle power of flapping; instead it snaps open its wings and dips into global wind flows to cross miles of liquid earth, sniffing out squid, crustaceans and flying-fish eggs, which concentrate where masses of ocean water come rolling against each other.[16]

No one knew until recently where albatrosses really traveled. Now people tape transmitters inside the bird's upper back feathers, so that an antenna sticks out. It sends radio signals to orbiting satellites that use Doppler shifts to calculate the bird's position and email it to researchers. These people plot the bird's movements: jagged, erratic tracks following food across thousands of miles of open water. Eventually the transmitter battery dies, and the albatross path goes blank.[17]

No humans live on Kure. It appears in historical records mostly as a site where ships ran aground on the shallow reefs. The State of Hawai'i, which manages the atoll as a wildlife refuge, allows no visitors, except scientists and researchers. Susan and David got special permission to go. They caught a ride on a research boat searching out old shipwrecks. They intended to stay on the island three days. They stayed three weeks.[18]

They arrived just before breeding season for the Laysan albatross, a goose-sized bird with a white body and a dark cape. It has a hooked orange beak it uses to spear prey, and pinkish feet. Dark feathers surround its eyes and shade onto its cheeks, making it look dramatic, serious. Thousands descend on the Northwestern Hawaiian Islands in winter to mate and lay eggs—a living snow cloaked by its own shadow.[19]

Anyway, that's how a biologist described the breeding birds at Midway. Like Coleridge, I have never seen an albatross. Since it's an animal synonymous with motion, it doesn't keep well in captivity.[20]

THE PHOTOGRAPH

I die therefore I am
– Judith Goldman[21]

The photographers returned to Kure in May 2004. They found albatross chicks sitting in nest bowls on every inch of ground, waiting for their parents to come back with food from the ocean. The chicks had advanced to that odd, in-between state called adolescence—fluffy grey down erupting in awkward bits from sleek, adult feathers.

The photographers set up shop in an old Coast Guard shed, a small square of shade in the blinding white. Albatrosses evolved without mammalian predators. The chicks viewed the humans as objects of curiosity, not a threat. They behaved like toddlers, Susan wrote, putting everything in their mouths, tugging on tent lines, biting shoes and snatching bits of clothing left out to dry.[22]

One chick nested just outside the shed. "We passed it every day when we came out to photograph," says Susan. She uses "it." As far as she knows no one ever determined this bird's sex. She has told this story many times, in places all over the world. "I named it Shed Bird," she tells me. "We said hello and talked to it—you do that kind of thing when you're out there for eight weeks. We watched it get bigger and bigger."

Shed Bird started to spread its dark wings, preparing for a life in air. "When the winds come in, the fledglings start to sense it. You can tell they are realizing they have wings and what they might be for," says Susan. "They jump and hover for a just a few moments. When we saw that, we knew pretty soon Shed Bird would be gone."

One day David found the bird panting in the hot sun. It fell over and didn't have the strength to get up. He moved the bird into the shade, sprinkled it with water and cooled it with a fan. Shed Bird seemed to revive. But the next day when they came, it had died.

The manager of the Kure Wildlife Sanctuary decided to cut Shed Bird open. Susan watched her make the incision. It revealed a stomach stretched tight and perforated in two places. "Then she took the knife and actually opened the stomach. It was completely impacted, full of plastic: disposable cigarette lighters, several bottle caps, an aerosol pump top, shotgun shells, broken clothes pins, a little toy like a spinning top."

Susan wanted to know exactly what killed Shed Bird. She put on gloves and began to pick out every piece of debris. The shards got so small she needed tweezers, three hours, flies swarming, the stench of rotting.

Susan removed half a pound of junk from the albatross chick, mostly plastic. "That bird was sturdy to have survived as long as it did," she told me. She talked to me over the phone. I was at home in Portland, and she in San Francisco. I had her voice recorded on a tape that I could then play back, typing the words as she spoke. Somehow this tape (old cassette technology, not digital) got tangled in its plastic case and broke, so now I can't go back and hear her voice. This is what I typed:

A. Why did you pull the plastic out of the bird?

S. It wasn't as though I planned on making a portrait. It was pretty emotionally driven, but it was also task driven. The primary impulse was curiosity. I wanted to know what was in there. I could see when she opened the stomach, I could see that it was mostly plastic, but I thought "I want to see every single thing that was in the stomach, everything. Every last thing."

A. Why?

S. I wanted it to be seen. That bird was stuffed with plastic, which had led to dehydration, malnutrition, and ultimately starvation. Obviously it suffered. It couldn't pass its stomach contents because it was

so severely impacted, it couldn't regurgitate and it couldn't accept food. That must have been a horrific experience for that animal. All the time it was spreading its wings, testing the wind, it was suffering, those sharp bits of plastic had perforated its stomach.

[silence]

S. We got to know this bird, we saw it every day for two months. I felt this responsibility to document it so that people would see it. That, I thought, was the least we could do for it.

Susan spread all the pieces out, more than five hundred. Then she took a photograph.

THE CURTAIN

September 1, 1939. Stanislaw Ulam lay sweating in a Columbus Circle hotel room on a humid New York City night. He couldn't sleep. Around one or two in the morning, the phone rang. It was his friend Witold Hurewicz, a fellow Polish mathematician. Ulam remembered the quality of Hurewicz's voice, somber and throaty. "Warsaw has been bombed," he reported. "The war has begun." Ulam decided not to wake his 16-year-old brother Adam sleeping in the bed beside him.[23]

They had not seen war coming. It was a "practice of magical thinking," Adam would later write, that convinced most ordinary Poles and their leaders that Hitler would not dare attack Poland even as he swept through Austria and Czechoslovakia.[24]

The Ulam brothers came from a prosperous family of lawyers and bankers in Lwów, ancient meeting point of East and West, crowded with stone buildings and cafes filled with people at all hours. Stan, the elder by 13 years, established an early reputation as a brilliant mathematician. He spent his time outside

of school in the coffee shops with professors and fellow students, working through the latest problems in the field. He claimed that one such session lasted 17 straight hours.[25]

Stan earned his doctorate in 1933. Few positions for mathematicians existed in Polish universities, and, as a Jew, Stan knew he had no future there anyway. Through friends he secured appointments at Princeton and then Harvard, but these were only temporary. Stan formed a particle in a flood of European intellectuals seeking refuge at U.S. universities. The American elite did not always welcome them, and in the midst of the Depression had few openings to offer. So Stan went home to Lwów every summer.[26]

In 1938 the Ulams' mother died. No one tells much about her, except that she had a long illness requiring many surgeries. The family crisis unfolded inside one of national proportions. Workers ravaged by the Depression rioted in the streets; the weakened regime courted the Fascists and Nazis to shore up its power; waves of anti-Semitic attacks swept the cities. Adam compared the change in atmosphere to being suddenly transported to a high altitude—one had to gasp for air.[27]

They decided Adam should go with Stan to study in America. Brown University accepted him for the fall term, 1939. The brothers spent the summer as they always did, lounging in cafes with friends. They took a trip to their uncle's estate in the mountains. Stan hated the humid New England summer and wanted

to put off their departure. They planned to leave September 3.

Only their father seemed to sense what was coming. He pleaded with them to go earlier. But even he could not envision the scope of the coming catastrophe. He made financial arrangements for Adam for one year, expecting them both to return the next summer.

In mid-August, Stan, Adam, their father and their uncle took the six-hour train ride from Lwów across Poland to the Baltic port of Gdynia. Stan and Adam boarded the *SS Batory* bound for the U.S. It would be the last ship to leave port.

A few days later, a German battleship entered the same harbor with 225 Stormtroopers on board. September 1: German forces occupied the Polish seacoast and swept south through the country.

Date, from the Latin for "given," now takes

its deeper dark framed

in flame a scar each

flesh event

Stan and Adam never again saw their father or their uncle, their sister or her new baby, most other relatives or their childhood friends. For the most part they never learned what happened to their family—a few agonizing clues over the years: their

sister and her baby probably shot by Nazis. Their father last known sheltering a refugee boy about Adam's age in Lwów, burning his law books to keep warm.[28]

Of that middle-of-the-night phone call, Stan later wrote: "It was as if a curtain had fallen on my past life, cutting it off from my future. There has been a different color and meaning to everything ever since."[29]

LOST

On January 6, 1942, Janie R. Christman received a telegram at her home near Mt. Angel, Oregon:

THE NAVY DEPARTMENT DEEPLY REGRETS TO INFORM YOU THAT YOUR SON ENSIGN ELWYN LEWIS CHRISTMAN UNITED STATES NAVAL RESERVE IS MISSING RESULT AIR ENGAGEMENT WITH ENEMY IN THE PERFORMANCE OF HIS DUTY IN THE SERVICE OF HIS COUNTRY X THE DEPARTMENT APPRECIATES YOUR GREAT ANXIETY AND WILL FURNISH YOU FURTHER INFORMATION PROMPTLY WHEN RECEIVED X TO PREVENT POSSIBLE AID TO OUR ENEMIES PLEASE DO NOT DIVULGE THE NAME OF HIS SHIP OR STATION=[30]

Christman managed to land his burning airplane in the ocean. He and the second and third pilots slid into the water through the navigation hatch. They pulled out the radioman Robert Lee Pettit. The flesh had burned off his hands and face. As the four moved away from the flames, the plane broke in two and sank beneath the surface.[31]

Of the seven-member crew, two had jumped before the plane hit water. They were nowhere in sight. The seventh, mechanic Andrew Waterman, sank with the plane, killed by Japanese machine-gun fire. The survivors cut off their heavy wool flight suits and inflated their life jackets. They had landed in the Sulu Archipelago some 20 miles from the nearest island. It was about 7 a.m. They began to swim, guiding Pettit, who could only float on his back.

By afternoon, despair had begun to set in. The sun blistered their skin and they burned with thirst. They decided that the copilot Bill Gough, the strongest swimmer, should go ahead and try to find help. Here Christman's official report diverges from the story told by Cecil Brown, the war correspondent. Though both record that Pettit could swim on his own by this time, the report from Christman never mentions him again.[32]

Brown writes that the three remaining (Christman, Pettit and third pilot Don Lurvey) agreed each should go alone. "I'm in a hell of a mess," Pettit said. "You guys go on without me." Nonetheless, they swam within shouting distance of one another. Around sundown, Christman called for Pettit and got no answer; he had disappeared.

Christman and Lurvey swam through the night. Christman would fall asleep swimming and start to sink, then suck in water and splutter awake. He began to hallucinate. He dreamed he swam through oil; he wanted to sit and rest on a pipe. Lurvey kept him going, pointed toward land.

Around noon the next day, they spotted an outrigger canoe sailed by Moro men.[33]

Christman's mother received a letter from the Navy dated January 9, 1942, offering sympathy for the "loss" of her son.[34]

Lost, from the root that means "loosen, to cut apart." The men's tether to the U.S. military broke the moment their plane hit the water and sank. Without the shell of a machine to surround them and make them visible from above, they became nothing, four specks in the shining blank.

It took 17 days, Christman and his men depending on help from the Moro, who knew the tides and currents and could safely thread their vinta canoes through the Sulu Archipelago's hundreds of islands. Moro men brought the Navy fliers to Sitangkai, the westernmost island in the archipelago, from which the Americans took an old diesel-powered launch across open water to Dutch military headquarters in Borneo. They continued south to Surabaya in Java by boat, plane and ship, following the retreat of the U.S. Pacific fleet. On January 12, 1942, Christman walked into U.S. Naval headquarters and reported for duty. This act brought him back to life.

DISAPPEARANCE

Since his arrival in the U.S., Stan Ulam had felt taken aback by the apoliticism of American academics. He remembered running into the logician Willard Quine on the steps of Harvard's Widener Library the morning that Roosevelt won the presidency. Ulam inquired what the philosopher thought of the election. "Who is President now?" Quine asked him.

When war broke out, Ulam bought every edition of all the papers, hoping for news of Lwów. He came across a picture of his brother Adam in *The Boston Globe*, surrounded by other Brown freshmen, with the photo caption "Wonders whether his home was bombed."

Denmark, Norway, the Netherlands, Belgium and then France fell to Hitler in the spring of 1940. "Despair gripped all the European émigrés on this side of the ocean," writes Ulam. The U.S. persisted in its isolationism; Americans believed their oceans would protect them. For the European Jews, it seemed even three thousand miles of water might not be enough to douse those flames.

Through friends at Harvard, Ulam got a job teaching at the University of Wisconsin in Madison. It was his ticket to staying in the U.S., but he wasn't totally pleased about it. For an upper-class European intellectual, the U.S. Midwest seemed like Siberia. He felt restless, agitated. He wanted to do something for the war.

As soon as he could, Ulam earned his U.S. citizenship, then volunteered for the Air Force, which had advertised on campus. At each step he encountered others displaced. He took his citizenship test from a Jewish man whose parents had come from Ukraine. He received his Air Force physical from Japanese medics "relocated" to Wisconsin from the West Coast. Ulam makes a joke about "losing blood to the Japanese" in defense of his new country. Blood, from the root

"to swell, gush, spurt. That which

bursts out." See

bloma as bloom, "to flower." Here

body as fact flowered

blood and skin flowered

hair bloomed bone. Here

fact a failure

to disappear—

The U.S. military would not accept Ulam. He lacked binocular vision—his right eye was myopic, something he had always kept hidden.

The page in Ulam's memoir that recounts this is followed by a reproduction of a pencil sketch of him done by his cousin, the artist Zygmund Menkès, in 1938. The sketch also appears on the cover of the book.

How did I not consider this drawing when I was thinking about Ulam's eyes? It sizzles with kinetic energy (quick slashes and scribbles define Ulam's cheeks, brow and hair—a squiggle even floats above his head, as if he were giving off smoke).

His eyes form the dark center, concentrated pools of scribble beneath two slash brows. The pupil of the right eye (the myopic one) sits farther upward than the left, partly obscured by the lid, leaving that eye mostly white, a blank.

Ulam's odd eyesight left him stuck in Wisconsin teaching math to Navy recruits as his wartime contribution. He burned for something more. He noticed that people had started to disappear from the school—physics professors and students. He wrote his friend, the Hungarian mathematician Johnny von Neumann, who had been spending a lot of time in Washington, about possible wartime work.

Von Neumann had Ulam come to Chicago and meet him between trains at Union Station. His

friend from the old world arrived at the tracks accompanied by two armed guards. This impressed Ulam. Von Neumann described a secret project taking place somewhere in the American Southwest. A few months later Ulam received his invitation to Los Alamos. He had engineered his own disappearance.[35]

GARBAGE

The picture of the albatross carcass bursting with plastic appeared in *National Geographic* in October 2005. Beside it ran the photo Susan Middleton took of the pieces she extracted from the bird's stomach, arranged on a white backdrop in an oval, "like an egg," she said someone once told her.[36]

A few readers wrote in to point out that a white shard in the lower right of the photo said VP-101, the name of Christman's WWII Navy squadron. The magazine assigned a researcher to find out more. Louis Dorny, a naval historian, called the plastic piece "typical" of Navy ID tags attached to equipment, like a toolbox, or a bombsight.[37]

Bombsight. The word fuses senses, monsterish. As if the bomb itself had sight and could seek its own target. Or it gave the bomber power to see like a bomb. Which would be what? A falling, blurred, a blast, maybe light and flame, and then what?

The bombsight in fact required the bomber to see the target with his own eyes. Then he could enter

altitude, speed and coordinates, and the machine would release the bomb at the right moment. It was supposed to give airplanes the power to destroy small things on the ground from very high in the air.

It never worked well, so pilots had to dive close before dropping their "eggs," which is what Christman called them in a letter home to his family: *Next week we are going to drop some 100 and 500 lb. eggs with T.N.T. guts.*[38]

> how the egg of a bird is crystalline, made of layers lined with minuscule air canals so the chick inside can breathe; how the thickness of each egg's shell meets exactly the pressure each incubating bird will bring to bear[39]

Each plane that flew to Jolo Island in the Philippines on December 27, 1941, carried three five-hundred-pound eggs.

Dorny considers the disastrous bombing raid that followed "the first, most obvious" event in which a piece of equipment like a bombsight might have been swept into the water. As he puts it: "many men lost, and mass confusion…lots of loose ends."[40]

Lots of loose ends. I never saw the photo of the albatross chick in *National Geographic*. I first encountered the piece of plastic in a 2006 *Los Angeles Times* article by Kenneth Weiss, who devoted two sentences to it.[41] It stayed in my brain, this relic from WWII found inside a dead bird some 60 years later. This persistent little bit of death in

life. It became an itch or splinter, contaminant. But I ignored it. I was writing a book at the time about a cemetery. I was trying to have a baby. And I was sick, I had to finally admit, sick from fear. Sick from fear and sick from grief at life in poor, sick New York, in a world so filled with illness. Sick of never being able to think past that blank in my life the morning I sat on the subway below the World Trade Center and felt the train shake from an impact and heard a noise and wrote "a thing that flies" in my notebook. A thing that flies. That beautiful September morning.

So I stayed there and swayed in my life between the *no* and the *yes*. Mostly *no*. Mostly *no* was winning. I spent all my time in a cemetery.

Then I moved cross-country, and, as Claudia Rankine writes, rephrasing César Vallejo, "any kind of knowledge can be a prescription against despair."[42] I started to think about this plastic bit. I wanted to know more. So I contacted Kenneth Weiss the reporter and asked for his source. He directed me to Curtis Ebbesmeyer, the oceanographer. Ebbesmeyer sent me to Dorny.

"Lots of loose ends," says Dorny.

Ebbesmeyer makes this guess: the piece of plastic got sucked into the Kuroshio current off the Philippines and spent 60-some years circling the North Pacific before an albatross plucked it out of the water, perhaps with nutritious flying-fish eggs attached, to feed to its chick.

It is the oldest piece of plastic from the ocean to which Ebbesmeyer has been able to assign a rough date. He and Dorny both presume it was made of Bakelite, but that is another gap—the piece of plastic has since been lost.[43]

This is what Susan Middleton, the photographer, reported to me in an email: "With regard to the bird's stomach contents, the last time I saw them was when I was carrying them around in a baggie and showing them in conjunction with presentations I did in Hawaiian schools in early 2006.… On Molokai I realized I did not have the baggie. I contacted the school but after a search nothing turned up. It seems that perhaps the janitor disposed of the bag, assuming it was garbage."[44]

"Garbage." The word once meant the waste parts of an animal.

A thing that flies. I wrote the phrase in a notebook just before coming above-ground to find the World Trade Center in flames, paper and debris cascading. I wrote it before I had any idea that the tremor on the subway train came from the impact of an airplane running into the building above me. I found the phrase again months later, looking through old notebooks for poetry material. I had forgotten completely I wrote it just before. The moment that can now be called "just before."

The notebook is gone now. I can't find it. It's not in any boxes of the journals I have kept since high school.

Lots of loose ends. There is no way to know the true origin of the piece of plastic inside the albatross. The VP-101 squadron existed from 1940 to 1944. It lost planes off the Philippines, Indonesia, Australia, as the Japanese pushed the squadron south along with the rest of the Pacific fleet. The piece disappeared somewhere within a vast battlefield of water.

Maybe Christman rubbed this bit of stamped plastic in his fingers as he sat waiting for his crew to fuel the plane and load the bombs. Maybe it hung from the life raft that burned so badly they couldn't use it. Or maybe it never had anything to do with Christman, his crew or his airplane.

The connection is, in that sense, false. I made it up.

But how else exist? How else but to feel a way across the bleeding gap (the gaps, what's left—blanks)? How else live, which means remain, continue.

When we packed to move cross-country I decided to get rid of them. All the journals for 20 years. I put them outside, four boxes, by the trash on 23rd Street in Brooklyn. That night it rained. I lay in bed and thought of them, the notebooks, outside getting wet. I got up and carried them back. They moved in the truck cross-country. But not that one, from fall 2001. That one is gone.

Maybe I threw it out in some kind of fugue state. I have always associated the word "fugue" with death, with funeral. Now I learn it means flight, the act of

fleeing. A thing that flies. Airplane or albatross. A person.

The notebook has maybe disintegrated by now, or it sits mummified with hot-dog buns and newspapers in some neighboring state that absorbs the trash of New York City. And what about the albatross chick? Susan doesn't know what happened to its body after she took all the plastic out. It decayed, she imagines, in the hot Kure sun.

"Flies, ants, and ghost crabs consumed the flesh in short order," she writes me, "eventually exposing the skeleton, and then that too, disintegrating…lots of calcium carbonate on Kure, from bones…coral… algae creating all that white sand."

Dissolved also, the airplanes that sank in sea water, the bodies of Christman's crew mates Pettit and Waterman. Or maybe their bones remain out there sinking slowly through sediment layers on the ocean floor.

What still exists, we know this—the plastic bits from inside the bird's body. Maybe they sit in the landfill on Molokai. Or maybe they're back in the water—washed down a storm drain or blown from a trash bin. The plastic will outlast the bones, the sand, this writing. How long? No one knows. Five hundred years? A thousand?

Decay means this: to turn into food for something else. Tiny living beings break the bonds that hold a substance together, transforming it into simpler

molecules they can use for fuel. These creatures are called decomposers.

Paper presents a challenge. It consists of cellulose—long chains of carbon, hydrogen and oxygen that make the tree strong enough to stand upright. Only certain creatures (bacteria, fungi and single-celled swimmers that are neither) have enzymes that can break apart these complex chains and turn them into sugar. They live in the guts of termites and ruminants. They move through water and soil.

Molecules that form in long chains are called polymers, which means many parts. Cellulose, skin, hair, silk—all polymers. So is DNA. And lobster shells. And protein. The first plastic (celluloid film for movies) came from cellulose, the most common polymer on Earth. The first synthetic polymer made in a lab using heat and pressure was Bakelite.

Now all industrial plastic comes from laboratory-fused polymers. The bonds take so much energy to make that they would never form outside a factory. Decomposers don't recognize these lab creations as food; they lack any way to break them apart and absorb them into their bodies.

So plastic becomes refuse: "a rejected thing, waste material, trash."

Of no use to any living thing, it lasts.

ADVENTURE

eely things water weedy things
will be thoughts
—Alice Notley

Stan Ulam at first felt out of place in Los Alamos, a mathematician among the physicists. The long formulae scrawled across blackboards scared him. But he soon got a grasp of the laws that predict how objects interact. He wrote: "I found out that the main ability was to have a visual, and also an almost tactile, way to imagine the physical situations…. Very soon I discovered that if one gets a feeling for no more than a dozen…radiation and nuclear constants, one can imagine the subatomic world almost tangibly."[45]

To see as if

to touch. To see, an inside

sense, a sort

of felt thought. Ad-

venture from its

root—a thing on

the verge, about

to arrive.

Ulam's first assignment at Los Alamos: imagine how to spark a thermonuclear fire for the first time on Earth. Scientists had recently figured out how such reactions power stars. Only the fusing together of atomic nuclei could create enough energy to burn at such high temperatures (millions of degrees) and sustain such long-lived fires.[46]

The force that fuels stars could create a "super bomb" here on Earth, a weapon of unmatched violence. The problem: it would need an atomic bomb to get hot enough to ignite. Such a thing did not yet exist—the fact that an atomic nucleus could be split had been demonstrated only a few years earlier. So the endeavor remained theoretical, in the realm of thought only.

Edward Teller led the effort to think a super bomb into existence. A physicist from a wealthy Hungarian family, he ended up at a mesa top in the U.S. Southwest (like Ulam and so many others) in the wave of displacement driven by violence in Europe. Ulam describes him: "When I first met Teller, he appeared youthful, always intense, visibly ambitious, and harboring a smoldering passion for achievement in physics."[47]

War shaped Teller's life from his earliest existence. World War I swallowed up Europe when he was eight years old, and he sensed its looming threat. "I remember the gloomy news in the fall of 1914," he writes in his memoirs. "Lemberg…a city a hundred miles from the boundary of Hungary, had fallen."[48]

Lemberg is the German name for Lwów, the city of Ulam's birth, now Lviv in Ukraine. The shifting titles for the city bear witness to seven centuries of conquerors. The Russian occupation in 1914 that worried Teller drove Ulam and his family to Vienna. Ulam's father served as an officer in the army, and the family moved from place to place, not returning to Lwów until after the war.[49]

Anti-Semitism pushed Teller out of Hungary at age 18. He went to Germany, the center of the scientific world, where chemistry reigned supreme. It had risen from an obscure art, the legacy of alchemists, to a field that performed real-life miracles, transmuting the gunk left from burning coal into drugs and plastic and fertilizer, and making its inventors rich.[50]

Teller studied the chemistry of polymers, but the strange problems of physics pulled at his curiosity. Physics would soon eclipse chemistry as the science of wealth and war, but in the '20s it remained an esoteric backwater. Teller needed permission from his father to switch to an arcane field of study with an unclear future.

By the time Ulam arrived in New York in fall 1939, Teller was at Columbia, working with other European refugees to make an atomic bomb a reality. His colleagues were Enrico Fermi from Italy, who had just won the Nobel Prize, and Leo Szilard, Teller's fellow Hungarian. Fear drove them. A lab in Berlin had discovered fission; Hitler might be first to an atomic weapon. The foreign physicists wanted to warn the U.S. president about this new discovery regarding invisible particles, but they knew nothing about the workings of government.

They knew Albert Einstein though, and they thought he could get Roosevelt's attention. Szilard convinced Einstein to write the president a letter on August 2, alerting him to the possibilities of atomic fission. In the histories, this document stands as a pivot point—dark message laden with fate above a famous signature.

In fact, the words Einstein put his name to made almost nothing happen. It took months for the letter to reach Roosevelt, and more months for anyone in power to respond. Meanwhile, scientists across the U.S. (and in Europe, Japan and Russia) kept smashing atoms to find what hid inside them.[51]

One beautiful fall day in September 1941, Teller and Fermi strolled Manhattan after lunch, headed back to the laboratory at Columbia, where they were trying to spark a nuclear chain reaction. Fermi suddenly wondered aloud whether an atomic bomb could ignite thermonuclear fusion and create a weapon that burned with the power of the sun.

Fermi was one of the few people on the planet to have made this leap. The idea startled Teller. Over the next few days he conducted a flurry of calculations. He returned to Fermi with bad news: impossible. Such a bomb could not be built. But the idea, once formed, held him in its grip. He could not look away from it.[52]

DESIRE

The car part says HONDA in large letters, and it contains other markings, mostly incomprehensible to me but meant to communicate, obviously, to some person who could crack this code. One can ask the Internet anything, and it almost always supplies a certain kind of answer, but it has nothing coherent to say about this set of numbers and letters.

74101-SCO-0001

	1	2	3	4	5	6	7	8	9	10	11	12
94												
95												
96												
97												

L598-
4111-

100

HONDA

> PE-HD/PE-LD

I ask around a little bit. I email this code to people who know something about plastic, and something about auto manufacturing. No one can tell me much, but a chemist I know who is an expert on plastics tells me that the PE-HD/PE-LD means the car part is made of polyethylene, a mixture of high- and low-densities. He suggests I just try talking to someone at Honda.

The nearest Honda manufacturing plant is probably Greensburg, Indiana, two thousand miles away. But there is something called American Honda Motor Company at 16800 NE Sandy Boulevard here in Portland. The listing includes a number, 503-256-0576. I call. It rings without answer. Another listing

has a different number: 503-241-1400. This time a computer picks up with a woman's voice saying you have reached American Honda Motors and giving the hours—Monday to Friday 8 a.m. to 5 p.m. It is afternoon, a Saturday. Then she says "If this is an emergency call 310-781-4000."

I hang up. What kind of emergency could someone have that would require calling Honda Motor Company? I know the area code 310 is Los Angeles. I decide to call it. Someone answers after only two rings. His voice is so fast and clipped that at first I think he too is a computer: "Honda corporate security. This is Keith. Are you calling to report an emergency?" My first instinct is to hang up, but then I remember that sometimes calling 911 and hanging up brings the cops anyway. I imagine some kind of corporate security force (guys in suits?) showing up at my door. All of this goes through my mind very fast. "Oh," I say, sounding confused, "I guess I have the wrong number." "OK," says Keith, "that's no problem." He says this in a tone that sounds vaguely like a threat, like it's not a problem *this* time, or, it's not a problem but, if he wanted to, he could make it one.

I abandon the direct approach, for spying by Internet. Honda Motor Company on Sandy Boulevard appears unmarked on Google maps, a large, square facility—larger than any other building nearby. It has a flat white roof punctured by small apertures (skylights), many shadowed by what look like white crosses, just beneath the glass. The building borders a housing development cushioned by a thin line of

trees. A meticulously landscaped lawn faces Sandy. It has a teardrop-shaped pond (not for human use: no picnic tables or benches come into view). It is for aesthetics only, just to hide the parking lot from the road. In the back of the building something rectangular lies beneath a blue tarp next to some other boxy-looking objects that the resolution is not good enough to decipher—maybe shipping containers. They sit at the left side of a large plot planted with young trees in a tight grid. Zoomed out, the trees are too small to see. The plot looks like a scar of bare dirt. Next door is a strip mall with Teeny Foods, Skinny Mint, Strategic Pharmaceutical Solutions and Portland Specialty Baking. Across the street is Iglesia Nuevos Comienzos.

It occurs to me that Google maps are like starlight: this feels like looking down at what is real right now, but it could just be an image of something no longer there.

On Monday I call the Portland number for American Honda Motor Company. A woman whose name I don't catch picks up. I tell her I found a large Honda part in my front yard. I explain that I'm writing a book about plastic and I'd like to trace the origin of this car part. She listens in silence, then transfers me to the parts department. Selena picks up. I tell her my story. She suggests I call Honda corporate headquarters. "What do you make there?" I ask. "We don't make anything here. We're a parts supplier for dealers."

I decide to be a little persistent, "Oh, so you don't think that if I brought in the part (or read to someone there what was on it) they could tell me anything about it?" She asks me to tell her what it says. She sits in silence while I read off the long strings of numbers. "The first one is a part number," she says. "The rest I have no idea. These come from Japan." It's a pronouncement that seems to seal the mystery. "Do you think anyone else there might know?" "Let me check with my manager." She's gone for a while. I can imagine the conversation that takes place in some office nearby. She comes back. "My manager says you need to talk to Honda Corporate. They can answer all of your questions and give you everything you're looking for."

But I know that Honda Corporate cannot give me everything I'm looking for. I brought this dirty plastic car part, this piece of garbage, into my house. I had been thinking obsessively about a piece of plastic from World War II found inside the body of a dead albatross chick in 2004. I had told my friends I was going to write an autobiography of plastic, but I didn't have any idea what that meant. Then this car part appeared, tangled against my fence. It sat in the living room for a long time, until Jen asked how long I planned to keep a car part in our living room. I moved it into the bedroom, on the floor near my side of the bed. It makes a flat "clap" against the floorboards when I trip over it at night. I want it to speak to me. I want it to tell me something about how to live. How to live now, on this planet, in this real life, as a member of the human species. The species that taught itself to dig fossilized beings

and light them on fire. That learned to take the same molecules out of those fossils, "crack" them apart and fuse them back together into this plastic car part. The species that figured out how to ignite the fire of the sun on earth—not species, the people, the individuals that form the shadowy backdrop of the walls of my birth. The names I have known my whole life. Edward Teller I met, an old man with a hairy, lion-like look, playing piano at the Lodge in Los Alamos. I want to know how my blood connects to this—to the love, the love-fused fear that drove the bomb makers. That drives them still, stockpiling their fear. To the car part and the moment of its creation. To the lives in it, lives lost, bodies and time. To the ancient living things that died and sank, to the hole in the ground where the oil came from, to the albatross chick, to the grandfather wielding a knife, to the ones who died in Hiroshima and Nagasaki, each life, to the atmosphere warming with the heat of this massive funeral pyre. To the fear, the fear, and grief, and desire driving this species of which I am so irrevocably a member, alive on this planet now, and what to do—what to do about being alive in a dying world. Where the terms of every breath seem to be death.

I wait.

For what—

a sign. For an albatross to wake from my chest and take flight.

But it remains just me. Me alone in a room with a car part, its dirty carapace curled around me. Me and my desire, which is boundless, sidereal. It glues its glittering look onto every surface.

THE THINKER

Claire Ulam Weiner does not want me to record her. She has agreed to meet me at a cafe in Santa Fe, all the while protesting that she is no expert on her father and not the right person to discuss his work. She is kind (she buys me a hot chocolate) but firm. She opens our conversation by firing off a list of people to consult and books to read. I have a hard time admitting what I long for: just a sense of him as a living, breathing person. I certainly don't lead with the question about what his eyes were like.

Claire's eyes are dark, so dark the pupil and iris merge. They spark.

She claims a typical immigrant childhood—she wanted to be more American than her parents. She threw herself into school life and social activities. She didn't take much notice of what her parents were doing. "I wasn't interested in science," she tells me.

She also knows little about her father's Polish past. "He really shut that off," she says. She didn't learn

she had an aunt and a baby cousin killed by the Nazis until she was in high school. She refers me to another cousin, Alex, one of Adam's sons, who just visited Lviv in Ukraine (formerly Lwów) and wrote about it for *The New York Times*. "He's the one to ask about family," she says.[53]

She is neither curt nor impatient. I sense she would never be rude enough to betray impatience. I get the feeling, though, that her mind moves very fast, and that she is eager to be on to the next thing, not inclined to divulge much to me. It is a bit of a burden, this meeting with people who have an interest in her father—a burden her mother Françoise, who died in 2011 at 93, used to carry. "People were constantly wanting her to come and talk to them," Claire tells me. "She was very with it until the end. Very anti-war, anti-bomb. But she was always careful about what she said."

I venture to ask about another cousin, the one who made the sketch of her father on the cover of his memoirs. She doesn't know anything about him, but she knows the drawing. "The eyes!" she says.

"The eyes," I agree. And then I can ask her.

She shrugs. "He had green eyes, like yours," she tells me. But I know his eyes were not like mine. Mine are hazel, brown in certain light. Too dark. In my mind, his eyes are luminous, blue-green, oceanic. I don't want to contradict her, though. So we sit in silence.

She moves for her bag. I fear she's on the verge of leaving. I mention Françoise's recollection of Ulam sitting in the living room and staring out the window, thinking. "Oh he was always like that," she says, leaning toward me. "He was always just sitting, thinking. Or he would lie on the couch, thinking. Or he would play solitaire and think. In fact, *The New Yorker* one year when I was tiny published a little squib about a young girl in Los Alamos who said her father never played ball or did anything but think. That was me."

I have searched old issues of *The New Yorker* and failed to find this episode. But it does appear in the book *Cardinals to Chaos,* a collection of essays dedicated to Ulam.[54] The front pages of the book contain an illustration of him, drawn from a photo probably taken for *LIFE* Magazine in 1962. Another photo of Ulam in similar dress for the photo shoot appears in his memoir. In the photo from the memoir, Ulam stands on Omega Bridge, which spans Los Alamos Canyon and connects the town-site to the weapons lab.

I can find no information about who named the bridge Omega, the last letter of the Greek alphabet, a mathematical symbol, and the title God claims, according to John, in the *Book of Revelation*: "'I am the Alpha and the Omega,' the first and the last, the beginning and the end."

Nameless workers erected the steel arch across the canyon in 1951, around the time Ulam had his vision for how to build a thermonuclear bomb. For most

of my growing up, my mother refused to cross that bridge. She was afraid of it.

The drawing is a montage of images, with Ulam in the center. Three white lines converge in his left eye—the good one. The top line connects to a drawing of ovals bisected by a triangle, probably a reference to Ulam cardinals, his early mathematical discovery that opened new ways of thinking about orders of infinity. The bottom line trails off into space. The center line extends from a sketch of Omega Bridge, soaring off its graceful arch. Ulam floats above it.

The collection of essays written in tribute to Ulam originally appeared in *Los Alamos Science,* the journal produced by the laboratory. In the Los Alamos version, Claire appears on the very first page. When Cambridge University republished it as a book, the editors moved her to the very end. Alpha and Omega. She appears aged five or six, with a pageboy haircut and a Mona Lisa smile below those dark eyes. The text below says:

"One day when Little Claire Ulam was watching some children playing ball with their father, a friend asked whether her father ever played like that with her. The answer was an emphatic 'No! No! All my father does is think, think, think! Nothing but think!'"

MIKE

The thought that came to Ulam as he stared out the window that winter day in 1951 remained secret for a long time. The government still considers its details classified.

The first person to reveal Ulam's breakthrough was Howard Morland. He joined the Air Force in 1965 because he wanted to be a pilot; he expected the war in Vietnam to be over by the time he finished training. Instead, he found himself flying transport planes across the ocean, bringing supplies to troops and returning, as he writes, "with dead bodies in aluminum boxes."[55]

One day Morland received training on transporting what the military called "special weapons"—nuclear bombs. Their small size shocked him (aluminum containers 18 inches around and six feet long), smaller than an average coffin.

As the war escalated, Morland started speaking out against it, and his commanding officers ordered him to the hospital for evaluation. He received

an honorable discharge for psychiatric reasons—the standard way out for officers opposed to war. For a few years, Morland drifted, but he became increasingly obsessed with nuclear weapons. He felt startled by most people's indifference to the fact that the U.S. and Russia had thousands of bombs that could wipe out entire cities in an instant. He thought people didn't really understand the threat they lived under, because a hydrogen bomb remained something exotic to them, almost imaginary.

Morland decided to make the thermonuclear bomb real for people. He wrote: "I wanted to prove with words and line drawings that nuclear weapons have size and shape. They occupy space. The parts are made by real people using real industrial equipment. They are transported, assembled, stored, and tinkered with." He set out to uncover the inner workings of the H-bomb.[56]

At Los Alamos, by 1951 Ulam had turned away from work on the Super. Nearly a decade after he arrived, the scientists were no closer to creating this weapon, and Teller and Ulam had grown to deeply dislike one another. Teller fixated on a design that Ulam had proved would not work. Teller's version packed a fission bomb with layers of thermonuclear fuel in an attempt to get the fuel hot enough to spark a thermonuclear fire, but the math indicated it would blow apart before it reached a high enough temperature.

Sitting in his living room that afternoon, Ulam suddenly saw how to overcome this problem. Why

not separate the bomb into two stages? Place an atomic bomb at one end of a cylinder, and the huge flux of radiation coming off the bomb would heat and compress the thermonuclear fuel at the other end, forcing its nuclei to melt together and creating fusion.

Ulam brought his idea to Teller the next day. Despite their animosity, Teller instantly saw how the new design could work. The two wrote a still-classified paper on a two-stage Super. Now known as the Teller-Ulam configuration, it forms the basis for nearly every thermonuclear weapon on the planet.[57]

None of this was public knowledge in 1978, when Morland received a contract from *The Progressive* magazine to publish a series of articles on nuclear weapons. But Morland was relentless in his quest. He pored over the scientific literature and crisscrossed the country, visiting weapons plants and talking to scientists. He developed the trick of speaking with authority on classified details he had only guessed at, lulling experts into thinking that the information must be public.

The Progressive published Morland's article, "The H-bomb Secret," in April 1979. The U.S. government sued the magazine and confiscated all the copies. Six months of court proceedings enabled Morland to keep talking to scientists and gathering details. He sensed he had gotten the basics right, but something about the design he proposed bothered him. He knew the weapon had two stages, and he knew the radiation from the atomic bomb

compressed the thermonuclear fuel, but he wasn't exactly sure how this mechanism worked.

Eventually, the government censors themselves revealed the answer. Morland's lawyers had to prove that everything Morland wrote existed in the public literature. To do this, they gathered testimony from scientists regarding the accuracy of Morland's article and the sources he had relied on. The scientists duly pointed out Morland's errors. The government censored the briefs before their public release, but they left one crucial paragraph intact, confirming that Morland had indeed gotten the role of radiation in compressing the fusion fuel wrong. His design was missing a crucial element: plastic.[58]

Radiation from the plutonium bomb could heat the thermonuclear fuel, but the original designers still worried the implosion would blow the assembly apart before the fuel could get hot enough. They needed some other material to intervene, a material of low atomic weight that would not interfere with the reactions. They chose polyethylene, just carbon and hydrogen, made from the bodies of ancient sea creatures, out of the same molecules that make up every living being.

The Los Alamos builders nailed thick slabs of polyethylene inside a cylinder-shaped casing that contained deuterium fuel. A relatively new material in 1951, polyethylene would soon become the most common plastic on the planet—used in shrink wrap, Hula hoops, Tupperware, water bottles, plastic bags

and the car part that ended up one day tangled against my fence.

Later designers made improvements on this model to shrink the size of thermonuclear bombs to as little as one hundred pounds. They filled the channel of the bomb casing with plastic foam. The most recent material seems to be something called Fogbank—a mysterious polymer so light it is nearly invisible. When the atomic bomb goes off, it heats the plastic to a million degrees in an instant, creating a plasma that expands explosively, squeezing the deuterium and igniting a thermonuclear fire.[59]

The result of Ulam's idea that day was Mike, the first thermonuclear device. Ignited at Eniwetok Atoll in the Pacific on November 1, 1952, Mike exploded with the force of a thousand Hiroshima bombs. It vaporized the island of Elugelab, leaving a dark crater in the tropical waters and lifting tons of coral and sand—the remains of sea creatures—into the atmosphere. Alive with deadly radiation, the tiny particles drifted around the world and fell back down.[60]

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AUTHOR BIO

Allison Cobb is the author of *Born2*, about her hometown of Los Alamos, and *Green-Wood*, about a nineteenth-century cemetery in Brooklyn, New York. Cobb is a 2015 Djerassi Resident Artist and a 2014 Playa Resident Artist. She received a 2011 Individual Artist Fellowship award from the Oregon Arts Commission and was a 2009 New York Foundation for the Arts Fellow. She works for the Environmental Defense Fund. She lives in Portland, Oregon, where she co-curates The Switch reading series.

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