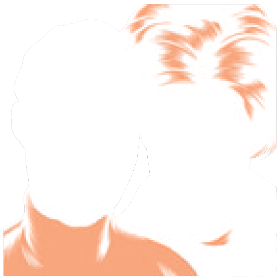


MARGARET AND CHRISTINE WERTHEIM

[THE INSTITUTE FOR FIGURING]

"IT REALLY DID SEEM LIKE A CRAZY CONSTRUCT."

Helpful things to have in order to crochet a coral reef:

Knowledge of non-euclidean geometry

Interest in embodied forms of reasoning

A global sewing bee of serious science communication

The one came out of the sciences, the other out of the arts, although that's probably the wrong way to put it, since they both came out of the same mother in the same place on the same day—identical twins, Australia in the late fifties: Margaret and Christine Wertheim—such that their subsequent divergence (physics and painting, respectively) may never have been as wide as it seemed, and their coming back together years later, in their adopted hometown of Los Angeles, to found the marvelously inspired Institute For Figuring (IFF), may never have been all that unlikely a prospect. The Institute, at any rate, is one of those heterodox polymath L.A. wonders—close sibling of the Museum of Jurassic Technology and the Center for Land Use Interpretation and Farmlab and Beyond Baroque—a center, in its instance, for the identification, elaboration, and celebration of all manner of delicious affinities between the sciences, mathematics, and the arts, disciplines that, to hear these twins tell it (in their vividly infectious and enthusiastic manner), may themselves also be well-nigh identical under the skin.

Such, at any rate, is the claim being advanced in their latest, most ambitious (indeed, almost all-consuming) project: a vast crocheted coral reef that somehow manages to meld non-euclidean mathematics, marine biology, evolution, environmentalist concern, feminine handicrafts, and good old-fashioned community activism into a dazzlingly colorful and ever-expanding monument, one, indeed, that is fast becoming the global-warming equivalent of the AIDS Quilt. It is as much a call to urgent action as an occasion for hushed marvel: a creation almost as vivid and various and alive as the reefs whose perilous situation it so urgently seeks to draw attention to.

In its latest incarnation, this ever-growing crocheted coral reef, having previously alighted in Chicago, New York, L.A., Lon-

Illustrations by Charles Burns

don, Dublin, Sydney, and countless other venues, holds pride of place in the Sant Ocean Hall at the Smithsonian's National Museum of Natural History, on the mall in Washington, D.C., through April 24—and it's well worth a detour, indeed an entire expedition. Where it will go from there, and for that matter where it came from in the first place, were among the questions I wanted to pursue when meeting with the twins a few months back—that's Margaret in the pixie close-cropped hairdo, Christine with the wild leonine mane—as they were preparing to mount that show in Washington: a town, as much as any, where the fate of the world's reefs, and for that matter the entire lifeworld they so precariously evince, may well be decided in the years immediately to come. —*Lawrence Weschler*

I. CANARIES IN THE COAL MINE

THE BELIEVER: What is the Institute For Figuring?

MARGARET WERTHEIM: It's an organization that Christine and I founded in 2003. It grew out of conversations she and I were always having about the aesthetic and poetic dimensions of science and mathematics. *Figuring* is a word that Chrissie and I have both always deeply loved because it cuts across not only science and art but also mathematics and cognition. We paint figures, we draw figures. Figures are diagrams that describe scientific concepts. They're also numbers, and we all personally have a figure. We also speak figuratively and….

BLVR: Both scientists and artists spend their lives figuring things out.

MW: Yes. As soon as we hit upon this idea of founding an organization that might provide a framework for public events around this intersection of science and aesthetics, we immediately knew it would be called the Institute For Figuring.

BLVR: And you're based in Los Angeles.

MW: Yes.

BLVR: But anybody talking to you can recognize that you both have Australian accents.

MW: We were born in 1958 in Melbourne, though we moved to Queensland when we were six and were largely raised there.

BLVR: Queensland, Australia, among other things being where the Great Barrier Reef is—which, as we will presently see, becomes an important part of the story.

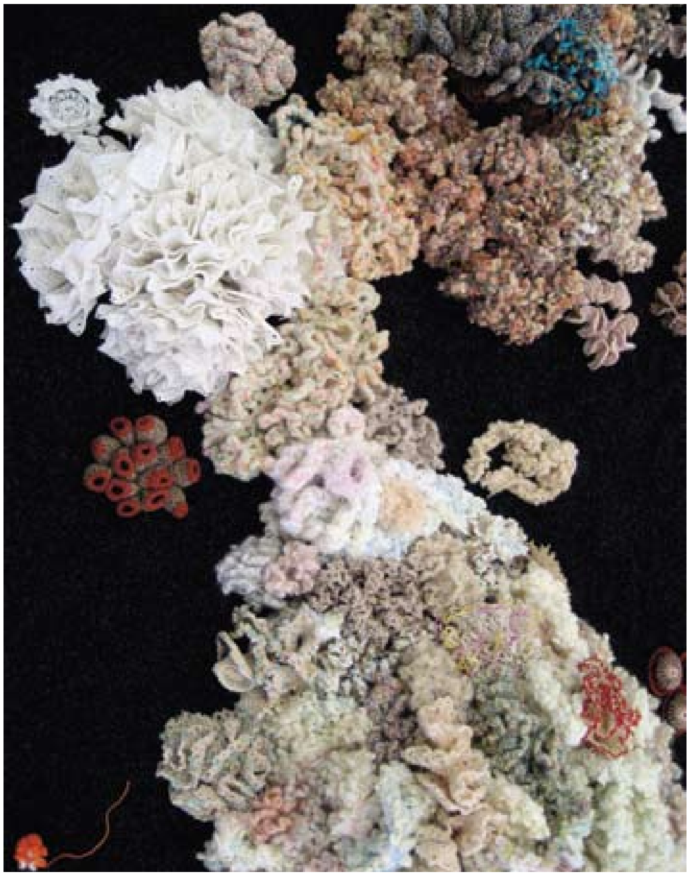
CHRISTINE WERTHEIM: The Great Barrier Reef starts about a thousand miles north of Brisbane. The irony is that neither of us had ever been to see it while we lived in Australia. I've been there only since I've lived in the U.S., and so has Margaret. Still, it's very prominent in the consciousness of Queenslanders. We all feel it's in our hearts intrinsically. I guess it's a bit like Americans feel about the Grand Canyon.

BLVR: So, admittedly skipping over all sorts of interesting other aspects of your lives—your early days as a physics student, Margaret, from whence you shifted over to science writing; and your life, Christine, moving from dress design to a decade as a painter, on through your current status as head of the MFA Writing Program at CalArts—you are in the United States doing different work, and beginning to hear about what's going on with the Great Barrier Reef. How did you start hearing about the plight of the reef?

CW: The reef has been "in plight" since we were children. When we were kids there was a huge infestation of crown-of-thorns starfish, which had somehow been imported and had no natural predators, and they began to take over massive sections of the reef.

BLVR: It occurs to me, by the way, that we should tell people what the Great Barrier Reef is. Give us some sense of its scale.

MW: The Great Barrier Reef is the world's largest organism. It's in fact the first living structure that can be seen from outer space. It's by far the biggest reef in the world, occupying about one hundred thirty-three thousand square miles, and extending over twelve hundred miles along the coast.



The Bleached Reef *by The Institute For Figuring. Photo © the IFF.*

BLVR: Amazing. And, by definition, a reef is a congregation of coral and the organisms that they feed on and that feed on them?

MW: A reef itself is the conglomeration of what's built by all the coral organisms. The Great Barrier Reef is the world's largest accumulation of these stony coral structures, built up over thousands of years by tiny little creatures called polyps. The reef itself is the structure that the polyps build, but then there is a whole ecosystem that lives around this structure. There are only about a thousand species of stony coral in the world, but scientists estimate that between 1 million and 9 million species live on coral reefs. It's believed that close to 25 percent of all marine species live in coral reefs, so if major reefs—like the Great Barrier Reef—are destroyed, it will probably lead to the collapse of the ecosystems that depend upon them.

BLVR: Which brings us to the terrible, seemingly cataclysmic threat currently facing the Great Barrier Reef, along with the world's other reefs, which is global warming. Give some sense of the nature of that threat and then also the extent of the damage recorded so far.

CW: Recently, scientists have come to understand that one of the primary dangers facing coral reefs, in addition to overfishing, agricultural runoff, and other pollutants, is the fact that water temperatures are rising. Corals are very sensitive organisms, and the little polyps that make up the reef are like the canaries in the coal mine of global climate change. If water temperature around a reef rises by more than about one degree Celsius for even a few weeks, corals begin to get sick and go white, a phenomenon known as "coral bleaching." If the temperatures drop back, they can recover to health, but if the temperatures stay high, they'll begin to die, and stay white permanently. This is one way scientists realized there was something problematic occurring, because large sections of the Great Barrier Reef were getting bleached on a regular basis. When we were children, bleaching was rather rare, but over the past fifteen years it's been happening on a massive scale every couple of years.

BLVR: What percentage of the Great Barrier Reef has already been damaged?

MW: Something like a third of the Great Barrier Reef has been seriously damaged. And in the Caribbean, since the 1970s, 80 percent of the reefs has disappeared. Coral reefs are dying proof that global warming is not some distant danger; it's here and happening now.

II. CRAFTING HYPERBOLIC SPACE

BLVR: Margaret, around the time you were growing concerned about the reef, you were also working on a book about the physical depiction of space, weren't you?

MW: Yes. It was a history of Western concepts of space from the Middle Ages to the Internet. I was interested in how our ideas about what space is have changed through time.

BLVR: And in that context, one of the things you were delving into was the distinction between euclidean space and non-euclidean space. People reading this won't understand for a while the way all of these things relate, but let's leave them in suspense. My understanding of euclidean geometry, which was good enough for two thousand years, is that it's all the geometry you could wring out of five basic axioms. Would that be a correct way of putting it? And of those, the fifth axiom was the one that was problematic.

MW: That's more or less right. Euclid's first four axioms are very simple things, like the definition of a line, the definition of a circle, and the definition of a right angle. But his fifth axiom is much more complicated. The easiest way to describe it is that it's the definition of what we mean when we say two lines are "parallel," so this axiom is also called the "parallel postulate."

BLVR: One version of the fifth axiom, for example, states that on a surface, if there's a straight line and a point outside that straight line, there's one and only one line that can go through that point and not intersect with that first line.

MW: Yes, that is the way that mathematicians now describe it. This way of putting it is attributed to the eighteenth-century mathematician John Playfair, who actually made Euclid's axiom more rigorous, and who, by the way, is important in the story of the IFF.

BLVR: Already in Euclid's time, people were not quite sure about that one. Is that correct?

MW: It had always bothered mathematicians that the statement of the fifth axiom seemed so much more complicated than the other ones, and they wondered whether it mightn't be possible to derive this axiom from the others. In the sixteenth century, people began serious efforts to do that. But after two or three hundred years of trying to prove that the parallel postulate must be true, they were finally forced into the realization that it wasn't. It isn't necessary for a coherent system of geometry.

BLVR: And a key person in that was Johann Carl Friedrich Gauss, right?

MW: Yes. Gauss, the "prince of mathematicians," was so disturbed by this discovery that he didn't publish his work. And so the two mathematicians who are usually associated with the discovery of what we now call "hyperbolic space" are Nikolay Lobachevsky and János Bolyai. What they showed was that, logically speaking, you can have a surface on which it is true that when we have a straight line and a point outside the line, there are an infinite number of straight lines that go through the point and never meet the original line. It seemed absurd, but such a system was mathematically consistent.

BLVR: In effect, Gauss and the others said, "What do you mean there's only one line that can go through that point and not intersect? What about…," and then they'd theorize a kind of parabolic line that would come from far away above the point and go through it and then arch back up on the other side, a big *U* that indeed didn't intersect the line below. "And what about a *U* that isn't quite so acute, a flatter *U,* and a flatter one yet? In fact, there are infinite lines that can go through that point and not intersect the first line." To my mind, the first objection to that argument, of course, is "Well, wait, those are all curved lines!" But, in effect, Gauss and the others are saying, "There is some surface upon which those lines must all be parallel and straight, as in not curved in relation to each other. We can't say what that surface would look like, but we can prove its existence, so it must be real."

MW: That's a good description of how we can represent parallel lines on a hyperbolic surface, but it's important to understand that back then, they didn't know how to draw such pictures. They just had to somehow imagine this seemingly impossible situation, and it nearly drove them mad.

BLVR: Now, when I talk to friends about this, I sometimes say that, on a sphere, for example, the shortest straight line between Paris and New York is one that actually looks like it's curved if you put it on a flat map.

MW: Yes, because when we try to project that spheroid shape onto a flat surface, we have to distort something. The same thing is true when we try to project an image of hyperbolic space onto a flat surface: our representations are inherently distorted.

BLVR: Hyperbolic space being this kind of non-euclidean space where there are infinite parallel lines going through that dot outside the one line. What are some of the things that became possible with non-euclidean mathematics?

MW: Well, these insights precipitated a revolution in geometry, especially through the subsequent work of Bernhard Riemann. Einstein's general theory of relativity is entirely based on Riemannian geometry, which is, effectively, the geometry of complicated curving surfaces. Non-euclidean geometry has also become a vital tool in computer animation; it's a really difficult mathematical challenge to get Shrek's robes to flow in a realistic manner.

BLVR: For that matter, wouldn't the very architecture of the Web be impossible without non-euclidean geometry?

MW: Not exactly, though it is true that people who are designing extremely large-scale databases, where you've got phenomenal amounts of information that need to be accessed, do use a discrete model of hyperbolic space as the underlying database architecture.

BLVR: For all the conceptual usefulness of such non-euclidean math and hyperbolic space, almost from the start, people took to asking, "But, seriously, what does this thing look like? Can anybody make a physical model of non-euclidean space?"

MW: There were quite a number of quips in the early nineteenth century from mathematicians to the effect that trying to imagine hyperbolic space would drive a person mad. Bolyai got a letter from his father, who was also a mathematician, warning him, "Fear it no less than the sensual passion, because it will rob you of your health, happiness, and peace of mind." It really did seem like a crazy construct.

BLVR: At a certain point, people began to think that it might actually be impossible to create a model of hyperbolic space.

MW: In fact, at the end of the nineteenth century, the German mathematician David Hilbert declared that you could not have a technically accurate model of hyperbolic space embedded in euclidean space.

BLVR: Let's move things forward a bit, toward the present. You were working on your book about the physical representation of space when you heard about a woman named Daina Taimina, right? Tell us a little about her story.

MW: Daina Taimina is from Latvia, where she got a

MICROINTERVIEW WITH S. T. JOSHI, PART II.

THE BELIEVER: So much of Lovecraft's work is framed as research and presented as a set of false documents. Can you describe the mythos he was attempting to create? Was it "fiction" as we understand it, or something else?

S. T. JOSHI: Lovecraft liked the idea of writing stories that were "hoaxes"—so convincing in their documentary verisimilitude that they could be mistaken for treatises (such as *At the Mountains of Madness*) or confessions (beginning so early as "The Statement of Randolph Carter"). In some sense he was following Poe, who felt that stories had to start with an essay-like beginning (remember the imperishable opening lines of "Berenice": "Misery is manifold. The wretchedness of earth is multiform") so that they could seem to be "true" rather than merely invented narratives; but Lovecraft carried this technique far beyond Poe. ✯

degree in mathematical computing. She married an American mathematician, Dr. David Henderson, a geometer at Cornell, and she moved to the States to be with him. Henderson is a great teacher of geometry, and has written a canonical textbook for university students about geometry. One day, he described to her the efforts of a colleague of his, the great Bill Thurston, who, in this context, was the latest in the long line of people trying to build a model of non-euclidean space. Thurston had built this model out of thin strips of paper of a very small tranche of hyperbolic space, but it was very hard to build and almost impossible to handle. And Daina looked at it and said, "You know what, I can take that and I can translate that directly into knitting and crochet." Back in Latvia, everybody knits and crochets. So she immediately sat down and made one in knitting, which proved a bit unwieldy, but then she realized that crochet was the way to go. Essentially, she took an idea that had been put forward by Bill Thurston, who's probably the greatest geometer of the last fifty years, and realized that you could translate it into a feminine handicraft and create these models easily and on a much grander scale. So it became possible to visualize hyperbolic space pretty readily.

BLVR: Is one of the morals of the story that there were no women mathematicians thinking about this issue, or, for that matter, not that many women mathematicians at all until just recently?

MW: Well, it is ironic that women who'd been crocheting and knitting ruffles for hundreds of years had inadvertently been crafting hyperbolic spaces. They'd literally been doing mathematics with their hands. And this reminds me that I wanted to come back to Playfair, who said something in the early nineteenth century that has become a sort of motto for the IFF: "We become aware how much further reason may sometimes go than imagination may dare to follow." One of the things that unites the projects we do with the IFF is that we are interested in embodied forms of reasoning, and the fantastic forms that can result when we "think" with our eyes and our hands.

III. MATHEMATICS IN YOUR HANDS

BLVR: So you went out to see Daina, and she showed you her crochet models, and what happened next?

CW: Daina was one of the first people we invited to take part in lectures for the Institute For Figuring, here in L.A., and then in New York, at the Kitchen. Actually, her models were very rigorously mathematical, without much variation, because she'd created them to illustrate specific geometric concepts. But soon I started doing some myself in bright colors like pink and green, and using things like sparkly and fluffy yarns. I was still dedicated, at that point, to maintaining the mathematical purity, but I started deviating a little as I grew interested in the properties of these models as material objects in addition to their formal mathematical characteristics. And after a while I had a pile of them on our coffee table, and I said to Margaret, "Oh, this looks like a coral reef. Maybe we could crochet a coral reef." And the next thing Margaret did was to put a notice on our website saying, "We're crocheting a coral reef. Come and join us!"

BLVR: Let's stop there for a second, because I want to make sure I understand this. Are we saying that coral reefs, that nature, over millions of years, have been engaging in something not unlike this amazing, mathematical, non-euclidean space, hyperbolic space? Would that be a fair thing to say?

CW: Yes. If you were to model the surface of many corals mathematically, you'd find that they do have a hyperbolic form, or at least a variation of this. And so do quite a few other things in nature, like lettuces, the edges of lettuces.

BLVR: For that matter, brains also occur to me.

CW: Funguses, cactuses, kelps. There are plenty of organic entities that are hyperbolic that mathematicians had been seeing all their lives, and they just failed to see the connection to non-euclidian geometry.

MW: It's worth dwelling for a moment on the difference between the pure mathematics and what is going on in living reefs and in our crochet reef. Daina's interest was in the pure mathematics. She wanted to be able to stitch theorems onto the surface of these models in such a way that she and David could use them in their non-euclidean geometry courses at Cornell. But in nature, things aren't perfect—for instance, we have the idea of the sphere, but there is nothing in nature that is a perfect sphere; we instead have things like eggs or sea urchins, which are kind of flattened or deformed spheres. The same is true for the hyperbolic plane: there are lots of things in nature that are imperfect hyperbolic planes, and that's the difference between nature and pure mathematics. Our reef project really came into being when, after two years of crocheting pure hyperbolic forms, in the mode of Daina's work, Christine said, "I'm sick of the pure geometry. I want to branch out and see what happens if I don't stick to the pure mathematical code. I want to see what I get if I distort the code." And as soon as she started creating mathematically impure versions of these models, they immediately began to look organic.

CW: Because in nature, the coral reefs are growing under dynamic conditions, so, for instance, they will deviate from pure mathematics if there is more sunlight coming from one direction, or more nutrients coming from another, etc.

MW: Nature is interested in feeding, efficiency, mobility, and not in pure mathematics, so a head of coral grows sometimes in the likeness of hyperbolic space, sometimes not. We wanted to work with that complexity. With this project, we took a beautiful, pure mathematical insight that Daina had developed and organicized it.

BLVR: Let's come back to the moment when you had this little pile of objects on your table, Christine's spangly colored ones, and you suddenly realized you were making a coral reef.

CW: At that stage we probably had only eight to ten models, and no sooner had we realized the connection with living reefs than Margaret put up a notice on the IFF website asking for people to join us. About two weeks after that, the Andy Warhol Museum in Pittsburgh rang up and said that they were doing a group show related to global warming and would we like to show our reef? And that was what really impelled us to get going.

BLVR: I remember going to see that show in Pittsburgh, in my then-new capacity as the artistic director of the Chicago Humanities Festival. We were well into programming the festival's next iteration around the theme of global warming. And the thing that struck me most was that when people were standing around looking into your vitrines there in Pittsburgh, many of them were actually moving their hands, trying to figure out how you'd done it. It was almost like polyps of inspiration were popping from out of your aquaria onto the creative consciousness of the surrounding gazers, who themselves now took to pantomime-crocheting in response. And the idea that I had when we decided to bring it to Chicago was that rather than waiting for the reef to be up before people started to respond, we could get classes and workshops going in anticipation, so that when yours arrived there would be a separate Chicago reef all ready to join it.

MW: So, yes, we came out in advance and held workshops.

BLVR: And, I should say, one of the great things about this project is the range of people it attracts—all across class and race lines (inner-city gospel groups, Northside rich-lady sewing klatches, school groups), how it brings them all together, and how, in turn, it transforms people who might not have given the environmental issues much prior thought into fervent activists.

CW: Indeed. That Chicago showing was our first solo show, and also the first time that our rapidly growing main reef was joined by a whole community reef, what we have come to call "Satellite Reefs." Over the years, we have come to feel that our favorite part of the reef project is this collective section, whose totality we call the "People's Reef." Since Chicago, there have been local satellite reefs made in New York, London, Sydney, Melbourne, Ireland, Latvia, and half a dozen U.S. states.

MW: We feel as if we spawned this child and it said, "Mummy, I want to be a star!" and it went off and became this wild, fantastical being, much bigger than us.

IV. THE GYRE, THE MIDDEN, AND THE REEF OF PLARN

BLVR: In Chicago, you began to explore, in addition to the coral reef, another ecological catastrophe known as the Great Pacific Gyre.

CW: Yes, the Great Pacific Garbage Patch, as it's also called. It's the place in the ocean where currents meet and form a huge whirlpool, and it's where a lot of the garbage that goes into the sea ends up.

BLVR: This is the garbage of the North Pacific Rim—all the garbage flowing off of California, Washington, Canada, Alaska, Japan, China: It eventually ends up in this massive gyre several hundred miles north of Hawaii and twice the size of Texas. And what does one find there?

CW: Well, in the old days you used to find wood and other organic debris—ships have always avoided these places—but now it's full of plastic, and because the plastic doesn't disintegrate, it's all just collecting. You get different reports as to whether it's two or three times the size of Texas, but it's about thirty meters deep, and the sea there is just laced through with plastic.

BLVR: And meanwhile this particular area of the sea is completely dead.

CW: Well, not completely dead, but they say that per square meter of ocean, there is now about six times as much plastic as there is living matter. And it is estimated that a million marine birds and a hundred thousand marine mammals die from ingesting this plastic every year. It's getting worse and worse, and it's finding its way into the food chain through microorganisms and jellyfish, etc. This huge amount of plastic is gradually replacing the food chain and killing whatever life is not yet completely dead.

BLVR: And how did this threat show up in your work?

MW: We learned about the Great Pacific Garbage Patch, or the Great Gyre, around the time we started preparing for your Chicago show. It was Christine who had the idea that we should crochet an evil sibling to our yarn-based coral reef, fashioning it out of plastic.

BLVR: The Toxic Reef. And it was being made out of sliced-up plastic bottles, and cassette tape, and all kinds of other things.

MW: We started cutting up our plastic shopping bags into strips and tying them together into yarn and crocheting with that plastic yarn. We found out, quite some time later, that in fact there was a whole craft-based movement that was crocheting things out of plastic yarn. It has a name: it's called *plarn*.

BLVR: Really?

CW: But we didn't know that when we ventured into it ourselves. Meanwhile, when we made the decision to begin a plastic-based toxic reef, we decided as an exercise in socio-ecological awareness that we would start keeping all of our own domestic plastic, just to see how much we use. We had grown up being quite environmentally aware, so we were already quite good about such things. But we kept our plastic for a week and we got horrified; and then we kept it for a month and we couldn't believe it! We've now been keeping it for four years.

BLVR: Oh, god. So where do you keep it all, and how much is there?

MW: We live in L.A., so we have a garage. We call the whole pile The Midden. There's nothing like keeping your plastic garbage to make you aware of how much of it you're using and to make you think, each time you go out shopping, Do I really want to bring home yet another plastic thing?

V. THE MOTHER REEF

BLVR: What kinds of contributors have come into the project's gravitational field?

CW: One of the great things about this project is the extraordinary individual women who've contributed. For example, there's an Australian woman, Helen Bernasconi, who was a professional computer programmer working in Europe, and she got tired of that and returned to a little farm in Victoria where she raises sheep. She shears the sheep, spins the wool, dyes the wool, and she crochets these amazing objects. She single-handedly invented what we call the "octopus form," with these incredible, delicate, hand-spun, hyperbolic tentacles. Another one of our most extraordinary contributors, Evelyn Hardin, lives in Dallas. She left school at sixteen and has no formal education in any field, but she's a creative powerhouse and a genuine outsider genius. Each time we'd get a box in the mail from Evelyn, we wouldn't know whether we were getting some big, ugly, flubbery thing made of videotape or some tiny, exquisite thing made of embroidery thread.

The project cuts across such enormous socioeconomic lines, and each woman who participates has a unique story, perspective, and artistic voice. In Indiana, they've actually done reef workshops in a women's prison. A math teacher in San Mateo, California, found out about the project and loved it, and there the third- to seventh-grade children were taught to crochet, and they made their own little reef. A wonderful crafter in Riga, named Tija Viksna, organized an enormous community reef made by more than six hundred women and schoolchildren all over Latvia, collectively producing this totally amazing work, the Latvian Reef.

BLVR: So it's now at the Smithsonian?

MW: Yes, at the Smithsonian's National Museum of Natural History. About two years ago, the museum opened the Sant Ocean Hall, which they'd been building for almost a decade, and we're the first people who've been invited to have an art exhibition in the temporary gallery they've set up there. It's a great thrill for us, because the reef project was conceived out of a desire to communicate about scientific and ecological issues, but for the first four years we were doing it, all the places we got invited to exhibit were in art galleries. It's taken quite a while for the science world to come on board.

BLVR: Why do you think that is? Is it a suspicion of handicrafts as not serious, or women as not serious?

CW: I think all of that. Gender is certainly an issue. As one project officer at a science foundation once said to us, "It's a bunch of women knitting; how could that really be about science communication?" It's been difficult for the science world to appreciate that there is serious communication going on in a project that is operating in some sense like a sewing bee.

MW: The art world has shown a tremendous generosity of spirit and openness to our ideas and methodologies that we really have not encountered in the science world.

BLVR: Now, just biographically, you guys were in the middle of your lives when this whole thing took off. This is the project that ate the twins. So what's the future? Are you going be able to extricate yourselves from it in some way? Will it be able to live on its own?

CW: Well, it is living on its own in the sense that in communities all over the world—Capetown, Oslo, Croatia, Japan, Australia—people are making their own reefs. There are communities in Florida and Wisconsin taking it up, and just recently we've had inquiries from Malaysia, Spain, and Krakow. They use the resources that we provide free on the IFF website, and we always send along materials to assist them. But we're not going to these places and having exhibitions of our own reefs. Just as living reefs replicate by sending out spawn, so, too, the crochet reef is spawning. It's become a truly organic thing.

MW: The bigger it all gets, the more monumental is the undertaking of housing it and preserving it. It is a bit of an overwhelming responsibility that does raise the issue, a bit like Judy Chicago's *Dinner Party,* of what will happen to all this work in the long run. Will it all sit in boxes in a storage unit, or will it find a home? The answer to that is very unclear. ✯