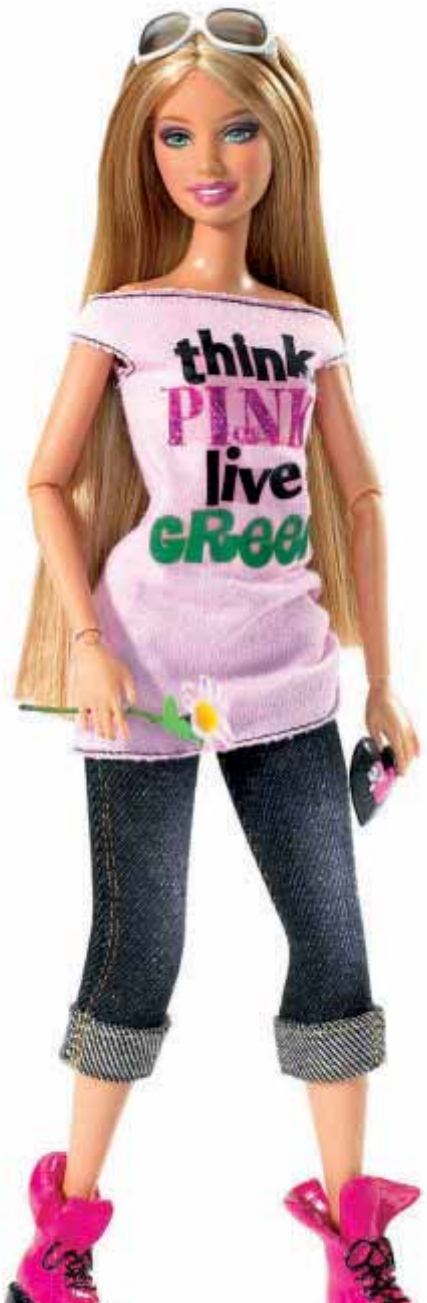
P L A S T I C S O U P

PLASTIC

JESSE GOOSSENS



SOUP

LEMNISCAAT

PREFACE

What arrogance to just discard our waste into the sea, as if it's our own private backyard! The only explanation could be that we weren't thinking when doing this. But we know now that our waste destroys marine ecosystems. Indeed, it imperils coral, plant, fish and mammalian life in the oceans and seas each year a hundred thousand dolphins are killed by fishing nets and this kind of waste. We are obliged to stand up for this beautiful and necessary life.

How did we manage to make such soup out of it?!

Why is this necessary? The scientific response is that ecosystems form the cohesiveness of life, allowing us to live on Earth. There is, however, a moral side to this ... We humans are only a part of life on Earth, but through our creative and cognitive abilities, we are capable of overseeing what effect we have, and thus we bear the responsibility to the rest of all life.

Jesse Goossens's important book dramatically illustrates the effect we have had. At the same time it provides hope by offering up solutions. It is not a work that imbues powerlessness, but rather it exhorts action. ACT Global is an example of a concrete initiative: something requiring our praise. But clearing up our own soup is not enough ...

We need to understand that we are part of a grand ecosystem which we share with all other life on Earth. Perhaps then we won't carelessly dump our waste by the roadside or in the water. But instead become more aware of the beauty of life around us—life which has as much right for well-being as we humans have.

I hope you enjoy reading and viewing Plastic Soup, and that it may inspire you towards Global Consciousness.

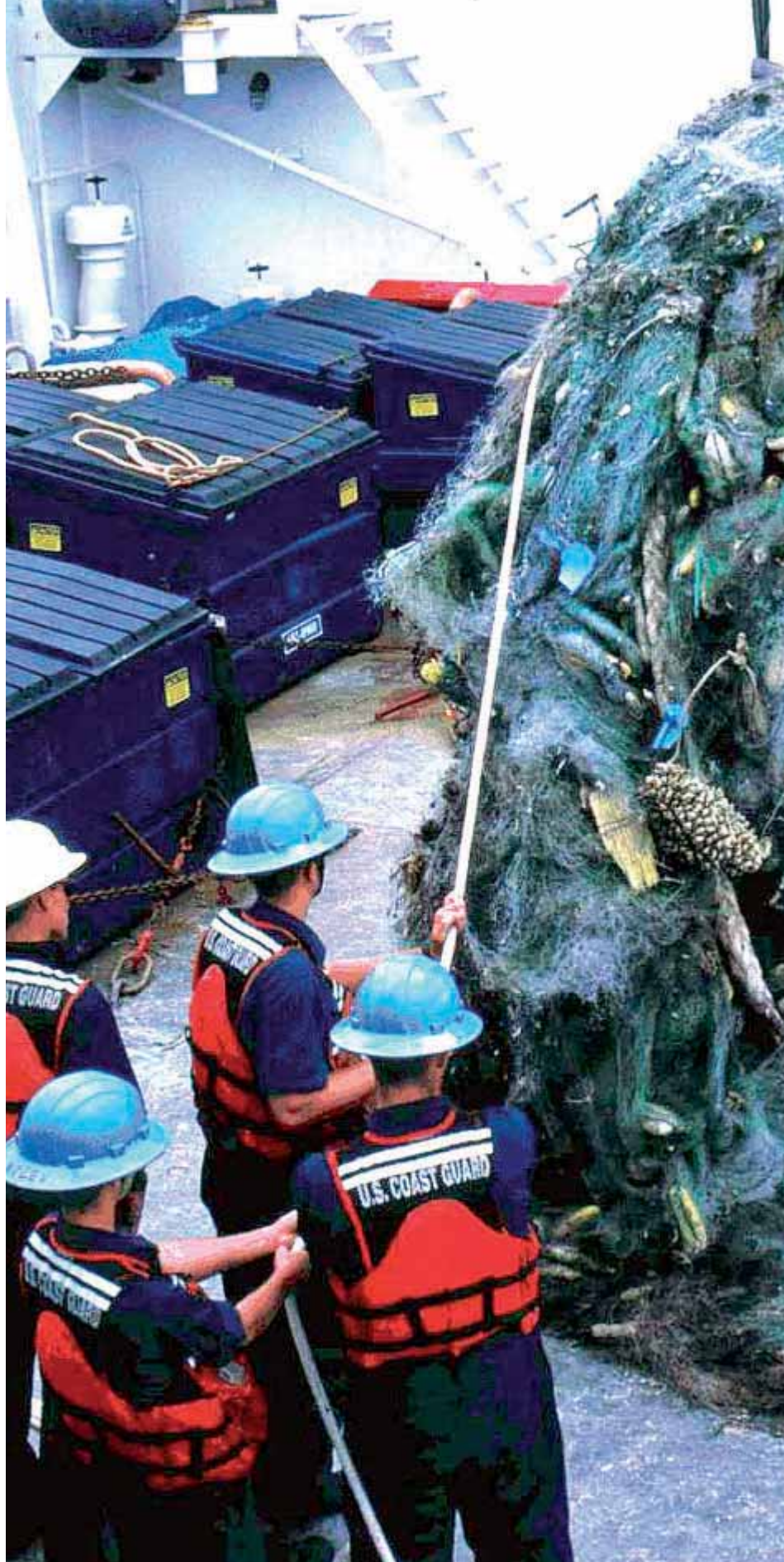
H R H Princess Irene

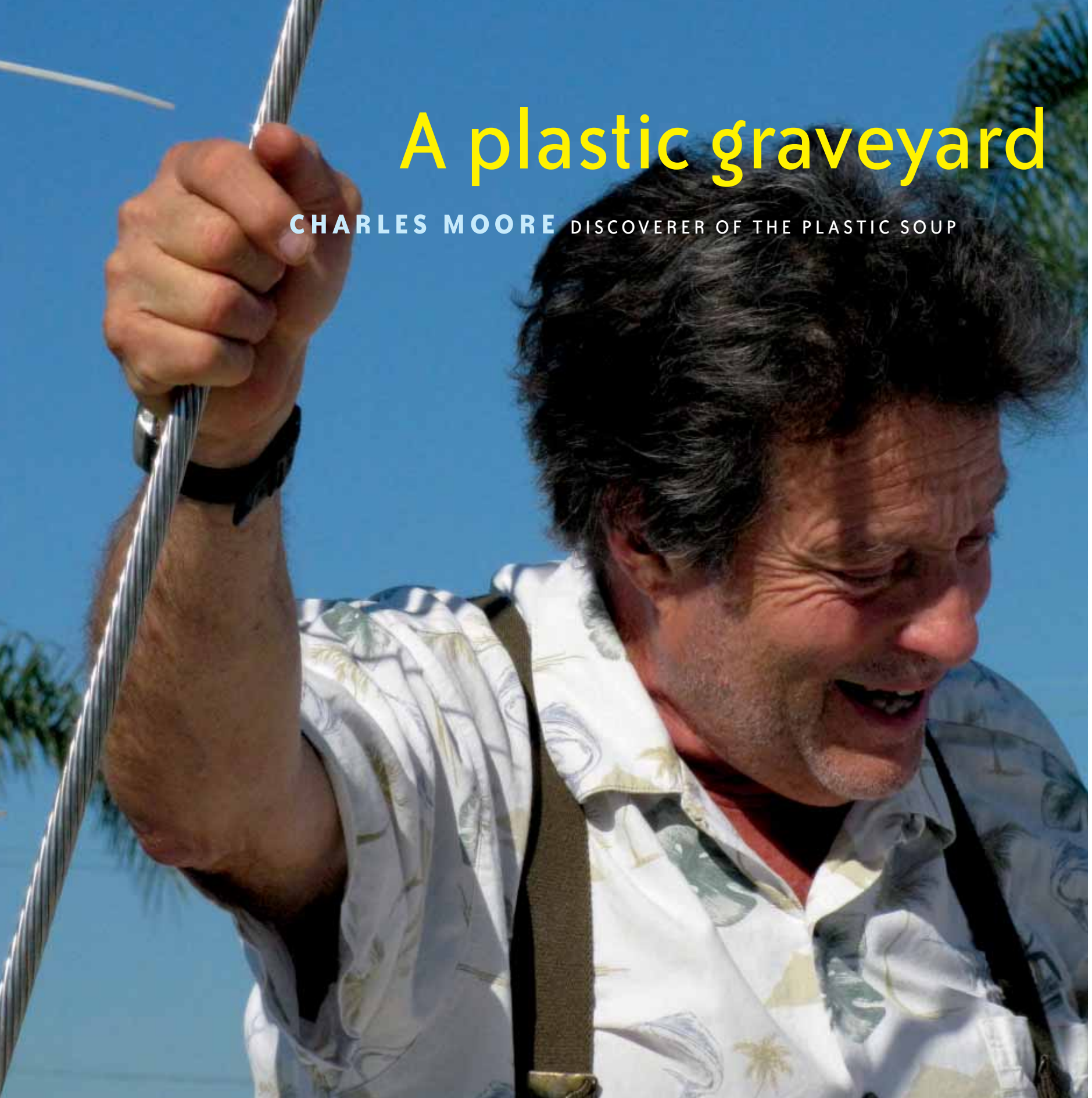
Ambassador for the Dolphin Fund

For Charles Moore
who has dedicated his life to a cleaner ocean.

Let's go change the world!
- Barack Obama

TABLE OF CONTENTS





A plastic graveyard

CHARLES MOORE DISCOVERER OF THE PLASTIC SOUP

in the ocean

Captain Charles Moore had just participated in the 1997 Transpacific Yacht Race, from Point Fermin near Los Angeles to Diamond Head in Honolulu, when he decided to sail back through the North Pacific Gyre. A *gyre* is a place in the ocean where various sea currents come together in a gigantic circular movement. The North Pacific Gyre is about 34 million square kilometers (10 million nautical mi²) in size ... Captain Moore was sailing with his crew on his Tasmanian-built catamaran Alguita through the gyre, when he made a discovery that would change his life. He had stumbled upon the "Great Pacific Garbage Patch"—the garbage dump of the Pacific Ocean—or, in other words: the "plastic soup."

"You can't really say it was me who 'discovered' the plastic soup," Captain Moore says in the cabin of the Alguita. "You make a real discovery at once, like Vasco Núñez de Balboa, who looking out from the top of a hill overlooking the Pacific in Panama, realized he had discovered a new ocean.

"Here it was different. Every day when I came on deck and stood at the stern, I would see something floating by—a bottle cap, a piece of plastic, a part of a soft-drink bottle—I wouldn't even have noticed it if it hadn't happened over and over again; day after day after day ... Well, over a period of a week, I saw objects floating in the middle of the ocean; covering a transect of about a thousand miles. I slowly realized that even though I was sailing through a part of the ocean that was as far away as you could be from human civilization, the influence of man was still continuously visible.

"I started to get disturbed by it; this was supposed to be a clean, untouched environment. Virginal. Yet the real seriousness of the situation only dawned on me two years later, when I returned carrying scientific equipment to take samples."

SHOCKING FIGURES

EEven after more than ten years, Captain Moore still shakes his head in disbelief about his discovery. "When you navigate a transect through the ocean, and you see a certain phenomenon re-occurring along your course, you know that this is not the only place where it occurs.

"The ocean is a single entity—I couldn't conclude otherwise: that it was like this everywhere in the ocean around my course line. That's why I decided to go back to study and measure this waste phenomenon.

"If it was really as bad as it looked—and this floating waste occupies a circular area with a diameter of a thousand miles—then the amount of plastic that has piled up here is as large as the annual deposition in the largest garbage dump in California."

And that assumption appeared to be the truth. During various research voyages with the Alguita, calculations were performed that in a quarter of the Pacific Ocean—an area of 8.6 million square kilometers (3 million mi²)—there is no less than 44,000 tons of floating plastic (5.114 kilograms per square kilometer). And that only covers the floating waste ...

DYING PLASTIC

How can it be possible that precisely at this location in the ocean, where there isn't a living soul to be seen, so much plastic is found? Captain Moore explains that the phenomenon is caused by ocean currents. Plastic from all over the world floats to this place.

"The Great Pacific Garbage Patch is the place where plastic goes to die. As a matter of fact, it's a graveyard. In a graveyard dead things decay; fall apart into smaller pieces. For that matter, in the oceanic waste graveyard, one finds something other than that found where the waste has been discarded. For example, in the North Sea, you'll find 'fresh' waste; pieces of plastic that are recognizable—bottles, bags—the larger fragments.

"The Great Pacific Garbage Patch consists of two parts: an eastern and a western section. The waste in the eastern part of the patch is older than anywhere else in the world; you can still find plastic there that was produced in the Fifties. The western garbage patch is being continuously fed by, among others, Japan. Between the western and eastern patch, there is a kind of highway through the water (in which you can still find larger pieces of plastic). But when I hauled in my net in the eastern patch (lo-

cated between Los Angeles and Honolulu), I noticed that there the plastic broke down into pieces that were even smaller than the mesh of my net (smaller than one third of a millimeter). This had not happened further west during earlier research.

"In sum, the closer you get to the source of the waste, the larger the pieces. The further you are from civilization, the smaller the plastic particles you find. They are the smallest, where they come to rest."

THE CONSEQUENCES

"The large and small pieces of plastic all have their own effects on the environment, explains Captain Moore. "The problem of the larger waste parts is that marine animals get entangled in it, dying as a result. In the northern part of the Pacific Ocean, drifting fishing nets alone kill a hundred thousand marine mammals each year, not to mention all the birds and fish that get entangled in them.

"The problem with the smaller pieces of plastic is that animals (especially scavengers) swallow them. There isn't much food in the ocean—neither at the top, nor at the bottom of the food-chain. Precisely because there isn't a lot of food, evolution has made sure that animals living here eat everything they can swallow; they do not survive on just one kind of food. So, they swallow all kinds of plastic. In some cases, fish consume more plastic than natural food; the same applies for birds.

"The smaller the plastic gets, the more dangerous—the more toxic—it becomes. It is precisely the smaller particles (those that are hardly visible to the naked eye) that cause the biggest problems. As it happens, the oceans contain tiny particles of toxic material that end up in the water via man. These are the so-called 'POPs'—Persistent Organic Pollutants—chemically toxic material such as DDT, dioxins, pesticides, PCBs, you name it. These toxins attach themselves to the smallest particles of plastic in the water. If you think about how the biochemical industry experiments using tiny particles to make drugs work, then you can imagine that we are, in fact, conducting a gigantic drug delivery experiment in the Pacific Ocean."

Besides the fact that the plastic particles are carriers of attached toxic substances, the plastic itself is also toxic. "There are between 80,000 and 100,000 chemicals that didn't exist before the Fifties. Nearly all of these

have not been tested in any way for their effect on human health and the environment," explains Charles. Some of these substances are being used in plastic. Chemists can experiment with these and create great new products. The plastics industry doesn't have to prove that the products containing these substances are safe. It is up to us to prove they are damaging ... While they earn from the product, we are left with nothing. Are we the ones who must spend money to analyze the products, to study what effects they have on the environment and our health, to make an evaluation and to create a hierarchical ordering of which products are the most damaging? Should we disrupt the production process too much by taking out of circulation more than one product at once? We seem only willing to remove the very worst products from the shopping list."

CLEANING UP SEEMS IMPOSSIBLE

'"When you think about the fact that there are plastic particles in the ocean which are smaller than 0.3 millimeters, how are you going to clean that up?" Captain Moore asks while making a helpless gesture. "When you start filtering the water, you will kill all the life that's in it; except the bacteria. It just isn't an option—especially considering small particles slip even through a fine-meshed net.

"Eventually the ocean will spit out all the waste—not in one blob—but little by little, the ocean will clean itself. But then, first of all, we have to make sure that no waste is added for this to happen.

"Larger pieces of plastic will wash up on beaches; it's up to us to make sure that they do not end up in the water again. Also, the sand at the bottom of the ocean will act as a repository, so that plastic particles that sink will eventually be covered by a layer of sand. Until then, plastic creates a big, life-threatening problem for all marine organisms. But eventually it will be expelled and become part of sediment or beach sand.

"This doesn't mean that we can or should do nothing. The larger plastic parts will break down in the sea into smaller parts. Therefore, I encourage any initiative to clean up the larger floating pieces. But that is very hard.

"There's an organization in Honolulu (National Oceanic and Atmospheric Administration—NOAA) that is focused on the removal of large pieces of fishing net from the Pacific Ocean. There are at least three ways in which nets and pieces of net end up in the ocean. For example, in some cases they have been deliberately thrown overboard because they served no further purpose. Sometimes they are simply lost: they fell overboard during a storm or a high wave, or broke loose from the ship. In other cases they are used as a Fish Aggregation Device (FAD)—a structure to attract fish (anything stationary in the ocean attracts animals). A stationary net provides protection for smaller animals, and subsequently, the larger creatures are attracted by the smaller ones. In this way, a whole arsenal of food develops around such a net. Tuna fishermen are aware of this, so they deliberately set up traps consisting of large 'balls of scrap' nets to attract large numbers of fish.

"However, so far, the Hawaiian organization fishing up the floating nets has not had much success. It's difficult to find these nets; a system to detect them has yet to be developed. They are getting closer to a solution, but yet haven't had much luck.

"Still, fishing up floating debris is the only practical way to solve a part of the problem at sea. We find all kinds of things out of the floating plastic alone. A day's sailing produces enough to cover the whole quarterdeck."

Captain Moore points to the large quarterdeck on the Alguita. “And the diversity of plastic we fish up is endless: from pieces of plastic film to crates, nets and household products.

“Everything we manage to fish up doesn’t pulverize into smaller parts and doesn’t entangle sea life. No doubt such an action alone would yield some sort of a positive result. I would encourage people to sail into the gyre and collect as much waste as possible. The more people who go there and become curious about the plastic soup, the more ideas will come forth about putting in place larger cleaning campaigns. Although we could never collect all the smaller pieces, we might improve at cleaning up the larger pieces.

“Only I don’t think that it’s an industrially viable project. Collection for any type of recycling or energy production would cost an incredible amount of fuel and time for a relatively small profit. You can work on this when you own a vessel like mine, and you have volunteers and all the time in the world. But when you have to pay a crew—how do you do it? This will not deliver a profit. Making a cost-benefit analysis, you will see that the cost exceeds the benefit.

“I think we have to look at who produced the plastic and pass the costs of the clean-up on to them. We are already thinking about this in Hawaii, through the Marine Science Program of the University of Hawaii at Hilo. The residents of Hawaii are among the victims of the garbage patch—the waste washes up on their beaches. They should trace the origins of the plastic, and then send a bill for the clean up to the countries from whence it came.

“In any case it is worthwhile doing a new cost-benefit analysis in which the environment is taken into account. Only then will we really know what the cost of this pollution is. However, there is no fish-based economy that we can render into dollars or euros; we can’t say that the loss of hundreds of thousands of seals costs a certain amount of dollars or euros. In monetary terms, you can’t even express the increase of unwanted species that live in this kind of waste: crabs, barnacles, algae, and bacteria.”

THE ENVIRONMENT IS CHANGING

Captain Moore talks about the growth of unwanted species. But what does plastic waste have to do with that? “Everything,” says Captain Moore. “When you travel along on an object that moves at a speed of twenty miles a day, you don’t cool down.” He clarifies this some more: “When you step into a plane here in California, and land in New York, you experience a huge climatic change within a few hours. However, this does not apply to floating plastic. It takes months, sometimes years, before plastic has moved to a place where the difference in temperature is only a couple of degrees. Over that time the organisms living on the plastic, can adjust to their new environment; to the new temperature. These could be exotic organisms that do not at all belong in the new environment into which they have floated. There are scientists who claim that when a total biotic mix occurs whereby plastic picks up all kinds of organisms and spreads them floating over the oceans, we lose half the biodiversity in the oceans.

“As an example, here in the United States we have prairies with native plants. But due to European plants having entered and spread across the country, native plants have been displaced. You lose biodiversity when exotic flora or fauna are so strong that they displace existing ones. Instead of adding something new to what is already there, a dictator is introduced; taking over power and expelling the original population. In this way, a successful new organism overwhelms the old organisms in the plant and animal kingdoms, and in the oceans. Right now this is happening all over the world, because we travel more and more, because of import and export, and because people arriving from everywhere bring their favorite plants and animals. And in the oceans plastic plays an important role in this.”

PLASTIC IS HERE TO STAY

It is not that Charles Moore is at war with the plastics industry as a whole: “By definition, plastic is not bad. My grandfather founded an independent oil company, (the Hancock Oil company), and at the same time he was an environmentalist. In the early years of the oil industry it wasn’t seen as odd to be an environmentalist and an oil producer. Oil has its good side. I think it can even be justified to say that petroleum saved the whales. The oil we got from whales was used for hydraulics, heating, and light. This order of giant mammals would have been decimated for its oil if we hadn’t found an alternative.

"It is the *abuse* of petrol that has resulted in the present situation and why, throughout the world, the atmosphere, water and land have become polluted. The unbridled and unrestrained application of petrochemicals developed by industry has infected the Earth. But, at the same time, technical development and new inventions have ensured that today we can do so much. That is why it is now possible to free mankind from the inevitability of destructive industrialization. Apparently, everything has contradictory aspects.

"Whatever future scenario you come up with, there will always be a demand for a material that is air-tight and water-proof. There will always be a need for plastics for medical applications. This is not a problem at all, as long as we focus on the whole process: on the overall picture. We have to start drawing up durability lists; lists of products that make other products redundant. Because the first thing we have to do is to decrease the amount of products that we use. A prize should be awarded for the design of products that makes other products redundant. This means that people should start thinking differently from the way they do now. Currently products are actually designed so that you have to buy more by-products and attachments.

"You might shrug this off, thinking the problem is too big to so something about it; but you could also start with yourself. Think about the patterns of your consumption. Ask yourself when you buy something: do you really need it? Ask yourself if you're not better off if you have less stuff. We are on a treadmill that compels us to collect more and more stuff. It's difficult to jump off that treadmill, but eventually everybody should do it."

WHO IS TO BLAME?

You can ask yourself who is to blame for this enormous problem, but Captain Moore finds this question of blame difficult. He would rather talk about "responsibility"—and on this, he does have a clear opinion ... "The largest share of responsibility over the discussion of the growing garbage dump lies with people who have been overlooked: the marketing geniuses. *They* are the ones who come up with new products all the time and who promote their novelty. Our society has traded 'utility' for 'novelty'. Nowadays, objects that are new and break down quickly, are more important in our economy than products that work and last longer. New and delicate can be replaced, and this brings in more profit than things that have a long lifespan.

"It's the same in the pharmaceutical industry. A generation that is healthy and lives longer, is, by far, less profitable for the drugs industry than a generation that is unhealthy and lives a short lifespan. Although they are able to increase human lifespan, the *quality* of life is not being improved. Instead, a lifestyle is created in which diseases are continuously battled.

"When I was still at school, nobody talked about medical insurance. It was just presumed that you could have a long, healthy life without going to the doctor. Now everybody presumes that you need all kinds of medicines, that you go to the doctor regularly, have to undergo treatment for all kinds of medical problems. This is the legacy of modern industrialization: more diseases, more treatments, more profit ... but less real health.

"People need space in freedom to discover their own possibilities and abilities. But right now, everybody is locked into a consumer pattern that is conquering the whole world ... A constant flow of new products, constantly paying more, constantly more treatments for ever more new diseases, junk-food, stress, non-stop working, sleep deficiency. Subsequently, this results in all kinds of symptoms that can be treated by

the pharmaceutical industry for a large profit. This rat-race will probably not change. People are fooled into thinking that they need this way of life. Why? Because then they will have more: more products, more luxury, more abundance ...
"We can't keep continuing at this level if the population keeps growing the way it does. The supplies of raw material are coming to an end. It is an impossible task to feed, clothe and house 10, 15, 20 billion people. A hundred years ago there were only 1 to 2 billion people in this world. Multiply this by a factor of ten in a couple of hundred years. If you reason sensibly, it is impossible to continue like this ... except when you also accept the reverse: that there will be more and more diseases, that the environment is being polluted, and that you will live unfree in cages like rats chasing their own tails.

"The ideas of 'change' have become more limited, in that when there will be change, it will be a minute adjustment. Yet, to really make it work for humanity, a big change is needed in order to review the whole system. Truly livable. Or to say it in French, give people back '*la promesse de bonheur*'."

REVOLUTION

To deal with the problem, the first step that needs to be taken is to make sure that no new waste is added. There are different ways to achieve this, such as less use of plastic, stopping the production of disposable plastic, recycling ... But the plastics industry isn't happy with most of these kinds of initiatives (to put it mildly).

Captain Moore knows everything about this. After all, a lot of money is involved in the plastics and oil industry. "In the United States alone, some 50 billion dollars a year are spent on raw materials to produce disposable plastic," he says. "The plastics industry itself can expect to lead a tough campaign against initiatives such as a ban on plastic bags. For example, Dow Chemical has paid Jean-Michel Cousteau, son of the famous Captain Jacques Cousteau, a large sum of money to promote the idea that the waste problem is caused by people, not the material itself."

It's therefore not easy for Captain Moore. "I feel like a lonely voice speaking out against a very successful, global economy," he says. "It has always stirred resistance when someone goes against the status quo—the pres-

ent state of affairs. In the course of history, the status quo has always been powerful, but now it even has global power; it is a world economy that is being guarded by armed power. Something like that is very hard to fight. But it needs to be made clear to the world that the apparent success and fortune that this economy has brought us demands; such a high toll that a complete revision of the situation is necessary. We have to speak up against the destructive methods of the ruling economy!

"The problem that will not go away is that the largest number of companies and people who have the technology at their disposal to provide a solution, use this technology to make a profit. They do not employ their knowledge to the betterment of humanity. Greed has become institutionalized—become part of the companies. Unless there are ways to help humanity, and to make a profit out of so doing—for themselves and for their shareholders—they just won't do it. Governments can put in place counter-moves to limit the pollution an industry is allowed to cause: if necessary, less profit with less pollution. But at this stage, 'less pollution' isn't even enough: the pollution has to stop completely. We need a complete change of mindset.

"First there has to be a desperate need to change before the change will really take place."

Captain Moore bangs the table to make the point. "The public needs to realize what a catastrophe the Great Pacific Garbage Patch means. They need to realize what this means for our human heritage. They need to realize that such a problem also occurs in space where millions of pieces of debris are circling the Earth. They must realize that the atmosphere is polluted. They need to realize that there is a global release of toxic substances, so that the concentration of toxins in the Arctic Ocean is so high that among Eskimo women breast feeding has become poisoned so that they cannot breast feed their babies.

"People need to begin to realize that a birthright is being denied them: that of a clean, beautiful world in which to live.

"Only when people revolt against this pollution will something change. It's the people that need to do something. They have to start the battle against the status quo."