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The Fragile Edge

Diving and Other Adventures
in the South Pacific



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The Infinity Pool

THE NEW OWNERS of the Hôtel Kia Ora have made many supposed improvements since assuming management, and the latest is a swimming pool spilling over an edge that appears to bleed directly into Rangiroa's incomparable lagoon. The cross-hatched geometry of the thousands of cobalt-blue tiles and white grout gives the pool something of the feel of an unfinished 3-D animation project, as if the designer is still fine-tuning the angles on a computer screen. Yet despite the mirage, the pool is real, so real that it makes the world around it less real somehow. And the lagoon, that turquoise gem filled with coral heads and all their attendant pleasures and hazards, becomes little more than a backdrop to the pool: an enormous screen animated with images of seabirds chasing schools of fish, whose panicked underwater skiddings ripple across the surface of the lagoon like invisible feet bunching up a turquoise rug.

All of this unfolds as the hotel's guests lounge, sipping tropical drinks and watching or not watching the real world out there, where things are chasing and fleeing and dying and being eaten. For the most part the guests choose not to watch, I notice, and so the beauties and dangers of this atoll devolve into a visual Musack. Perhaps because of this, the pool is a hit, a place desirously immune from reality, and during this visit to the Kia Ora I

never see a guest swimming in the lagoon, despite the fact that most of them are paying more than five hundred dollars a night for an overwater bungalow complete with a private swim step leading into it.

I like the new pool, too. In the fourteen years that I've been coming to this hotel, this is the first time I've been able to return from a day of filming, feeling sunstruck from hours on an open boat, and fling myself into the brackish water to cleanse the sweat and the stale suntan lotion. Someone will bring me a drink in the pool too, which they will not do in the lagoon, as well as little plates of fresh coconut and black olives marinated in mustard.

For centuries the lagoon was the island's obvious relief from the sun and the heat, and it still is for Rangiroa's residents. But for guests at the Hôtel Kia Ora, the pool is the new recreation center, although no one actually recreates in the pool as it's too small to swim in. Instead, during the last hours of daylight, when the lagoon is filled with Tuamotuans, the pool is filled with guests relaxing after their scuba dive or their visit to a pearl farm, glancing up occasionally to check the screen of the lagoon as it delivers its projections of the natural world.

Out on the water, caught up in the excitement of the hunt, a flock of *kirikiri* are acting like blackbirds in the stubbled fields of autumn. Swirling and bunching with elasticized precision, they gather above the lagoon, their dimensions expanding and contracting as the flock lurches between the air and the water. These noddies are about half the size of your common coastal gulls of North America, diminutive, and, like all terns, as pretty as butterflies. But whereas virtually all other terns are bedecked in white feathers with flippety black crests atop their heads, the *kirikiri* are photographic negatives: smoky, sooty-colored beings, with dark plumage blending upward in airbrushed perfection to smooth white foreheads.

To the outside observer, lounging in the infinity pool with a

pineapple-and-coconut-milk cocktail, their method of hunting appears to be composed of equal parts daintiness and chaos. Rather than the dramatic bill-first dives that most terns execute, noddies skip close to the surface, occasionally dropping into featherweight belly flops, but more often simply dipping their bills to pluck their prey from the surface. A flock of noddies working the water in this fashion looks like a visual representation of music, the black birds acting the parts of the notes, fluttering up and down the scales of the sky.

Their aerial gavotte is designed to overcome the limitations of finding tiny fish in a huge ocean, since reconnoitering alone might well prove metabolically more expensive than its payoff. In the loose company of others, with hundreds of eyes continuously scanning, the flock becomes a superorganism capable of locating food over a vast distance.

For flocking birds, virtually every aspect of their lives is influenced by the behavior of their flockmates: preening when others preen, sleeping when neighbors sleep, rising from the nest into the air when a flockmate gives an alarm call, initiating courtship when others are courting, too. In a sense, these birds with their much maligned bird brains are part of something bigger than themselves — a connected supermind that takes all the sting and the confusion out of solo decision making.

At their best, when sweeping across the water in tight formation, a flock of *kirikiri* acts like a single loose-jointed creature, stretching and pooling with the fluidity of liquid. In a seminal study of the shorebirds known as dunlins, researchers used high-speed film to decipher some of what goes on inside a flock of birds (film shot at high speed and played back at the usual twenty-four frames per second appears as slow motion). In the extreme slow motion footage of the dunlins, the researchers observed that the rapid changes of direction executed by the flock were not initiated by all the birds simultaneously but started from a single bird, or a few birds together — a movement that then radi-

ated through the flock like a wave. These maneuver waves took only fifteen milliseconds (fifteen-thousandths of a second) to pass from one neighbor to another.

Yet when tested in the laboratory, the dunlins' fastest reaction to the sudden stimulus of a flash of light was only thirty-eight milliseconds — too slow to account for the rapid response observed in individuals within the flock. The researchers concluded that the shorebirds reacted not to their immediate neighbors but to the maneuver wave itself, with individuals anticipating its arrival and changing course accordingly.

But one wrong move, one minute shift in direction between the onset of the maneuver wave and its arrival at the individual, would result in chaos, as the flock self-destructs in a monumental collision of broken wings. For the maneuver wave to persist as a beneficial behavior it must be foolproof. And anyone who has watched the rapidity with which a flock of shorebirds changes direction knows that maneuver waves are not constant events that express themselves outward to the edge of the flock before the next one is initiated. Instead, they morph unpredictably, like a tidal wave in a bowl.

Whatever the mechanism, the scene is the same most evenings. From the comfort of the infinity pool, the lagoon's surface appears glassy — until a school of baby fish bursts through, missile-like. The flock of *kirikiri* reacts as a single organism, cranking on its heels, fluttering down, as a dozen birds dip to the surface and return with fish flashing between the black forceps of their bills. Yet that's hardly the end of it. Within seconds, the black kites of frigatebirds, whom the Tuamotuans call *ota'a*, appear in the sky, wings tipped sideways, spilling air as they descend.

One *ota'a* singles out a *kirikiri* and the two begin a dance, more like a mugging, their wings flipping from one tack to another, sending the noddy skidding away from the frigatebird, who responds by wheeling around and threatening a collision. Brakes are applied. Tail feathers fan out. A second *ota'a* intercepts

the signal and sweeps in close enough to pin the noddy to the sky, where, panicked and fearful, it regurgitates the fish it swallowed only seconds ago. From above, a third frigatebird arrives at the falling morsel and scoops it up.

This daily drama is visible and audible from the infinity pool — although it competes for attention with the stereo system in the bar playing "Girls Just Want to Have Fun" in a French-Tahitian combo, and with a small group of Americans splashing in the pool. Drawn together by their inability to speak French, these visitors are as noisy and disruptive as starlings, engaging in an intense bout of social signaling, sorting out who lives where, who does what for a living, who drives what at home.

By eavesdropping, I can learn much about my fellow travelers to the coral world: the American woman from Queens with a painfully sunburnt back and a powerful, nearly operatic voice; the two couples, unknown to each other before this moment, polite midwestern types who would probably not be caught dead back in Wisconsin, or wherever, bragging, but who are nonetheless inspired by distance now, until all five are engaged in a bout of cheerful, competitive spraying. They are comparing their dive adventures: who has better gear, who knows what comprises better gear, who has traveled to more places, who has seen bigger and scarier things while there. They have an obsession with sharks — not surprising in light of the fact that sharks are the signature attraction at Rangiroa. But beyond this obsession, they appear to have no real interest in sharks. Judging from their conversation, their interactions are solely narcissistic: not what the animal did in relation to its natural world, only what it did in regards to them. *It came this close . . . It lunged unbelievably fast . . . It freaked when we came around the corner and found it sleeping . . .*

Meanwhile, out on the lagoon, a juvenile bigeye trevally caught by a noddy falls back to the water to be reingested by the ocean. Sometimes, with a big enough flock of noddies and an armada of aggressive frigatebirds, the little fish fall like rain, their reentry points marking the surface with the bull's-eye targets of ripples.

If you happen to be snorkeling or diving in the vicinity of a feeding frenzy while this is going on, you can see the little fish streaking like lightning bolts for the company of the school. With a homing sense as true as any bird's, they dash toward their beleaguered fellows, gathering until they form a subschool of survivors. If the subschool grows large enough, it may temporarily abandon the mother school, particularly if the battle is not going well for the latter.

Watching, you think it must be hopeless: that every last living creature in the sea or in the air desires these little fish, as bright as newly minted silver coins. Tossed cruelly into the hordes of the greedy, hounded day and night, juvenile trevallies live lives of unending terror under conditions of perpetual warfare. Yet they survive, many of them, somehow.

A school of predatory jacks, which the Tahitians calls *paaihere*, are dogging their heels from below. The noddies are skipping across their spines from above. The frigatebirds lurk in the shadows of clouds. Bunching together, the young fish spill and pool and reunite like loose mercury. When the *paaihere* attack, the little fish perform a defensive maneuver known as the fountain effect: the school instantaneously splits into two as each subschool reverses direction and circles behind their attackers on opposite sides. This behavior awards the trevallies a running headstart from their enemies.

Capitalizing on the momentary advantage, the little fish dive, trying to escape the reach of the birds above. But the *paaihere* are relentless hunters with big appetites and phenomenal accelerating abilities. They wheel around and come at the trevallies from below, herding them toward the sunlight, where the reflections of their bodies sparkle in the irises of the dancing noddies.

Trapped, the little fish unloose another defensive stratagem known as the flash expansion. Without warning or any apparent means of coordination, the school explodes, and members scatter shrappnellike out from an imaginary center. The whole reaction takes place in as little as twenty milliseconds, as each fish

accelerates to speeds of twenty body-lengths per second. Amazingly, the trajectory of each trevally carries it away from the center and away from its neighbors and is accomplished without any collisions — which would surely prove fatal under the circumstances. More astounding is that the entirety of the flash expansion occurs at speeds faster than the rate of nerve impulses traveling from the little fishes' eyes to their brains and back to their muscles. This defensive play has nothing to do with sight, and the little fish are as good as blind throughout it.

Curiously, computerized fish programmed to behave like a school of fish cannot perform as well as the real thing unless they are subject to some kind of a unifying field, which is itself influenced by all the individuals in the school, and which in turn links them together. Sight alone is not enough to maintain tight schooling. Neither are the lateral line systems that enable them to sense minute pressure changes in the water. Real fish that have been temporarily blinded with opaque contact lenses, and others that have had the nerves to their lateral lines cut, still manage to school effortlessly. Biochemist Rupert Sheldrake of Cambridge University proposes a controversial solution, suggesting that schools of fish and flocks of birds are coordinated by morphic fields that hold them together, and that both influence the individual and are influenced by the individual. Isolated from their flocks, most flocking birds will make Herculean efforts to reunite. Isolated from their schools, some fish, notably herring, die.

Afloat in the waves, we await the arrival of our Zodiac. We have run through every frame of film shooting silky sharks, silvertip sharks, and oceanic whitetip sharks in the blue water offshore, and are simply riding the current toward the pass. We are happy enough to drift and wait, our BCDs inflated like oversized pufferfish, our cameras out of film, dangling from the leashes on our wrists, though we are also tired and wordless and ready for a drink in the infinity pool.

Yet the end of this day has something more to offer. The birds

arrive first, guano and the occasional feather raining down. From our position, we are granted an intimate view of the choreography of the flocks, the elasticized precision, the muggings, the evasions. I tilt my head down and discover a ball of juvenile fish flashing and turning, stretching and collapsing like a hyperactive screen saver. In the darker water below, the *paaihere* lurk, their engines idling, until suddenly all hell breaks loose at a rate of speed human eyes cannot follow. Everything blurs, as if we have suddenly jumped dimensions. Without knowing what is happening, I instinctively stop paddling and pull my limbs into a floating fetal position.

Then, just as quickly as it started, the blur slows and begins to sort itself out. Little fish are everywhere, confettilike, glinting all over the sky of the sea. The feet of noddies dip and retract through the surface like wary bathers. In an instant the tables have turned and the *paaihere* — befuddled by the flash expansion — are on the run themselves, carving hard U-turns as they drop into the depths or flee for the surface. Powering through from below are the silvertip sharks, the linebackers of the reef. The *paaihere*, so deadly a moment ago, are now little more than hors d'oeuvres.

As if to flaunt this reversal of fortune, the silvertips travel with a contingent of juvenile golden trevallies — close relatives of the juvenile bigeye trevallies. This species spends its yellow-and-black-striped infancy riding the bow waves flowing from the noses of sharks. Too small for the silvertips to concern themselves with, the golden trevallies scrounge leftovers from their hosts' meals — in this case, bits of *paaihere* torn to pieces and floating away.

We take it all in as best we can — disadvantaged by fish super-speed, awed into silence, eyes wide, cameras empty.

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Inshallah

I'M ALONG FOR the ride this day shooting topside camera, a job that enables me to spend a lot of time in the presence of Manu, our Zodiac driver, both of us fending off the dual killers of the austral summer: the sun and the southern hemisphere ozone hole. While we wait for the divers to return to the surface, we take shelter — I under a large blue-and-white-striped umbrella from the Hôtel Kia Ora, Manu under a huge, weatherbeaten beach umbrella, complete with the ubiquitous Hinano (Tahitian beer) logo.

To scan the entirety of the horizon, we sit on opposite sides of the Zodiac's pontoons, looking past each other. One of the great pleasures of being on the sea with nothing much to do is the leisurely pursuit of watching and waiting, like being a fire lookout or a lifeguard, minus the responsibilities. We are confident that something will happen, as it always does on the ocean, although exactly what, when, or where is completely unpredictable. Perhaps it will be a school of flying fish bursting from the still water and soaring away on dragonfly wings. Maybe a dolphin will appear, its whistling call piercing the surface as it turns on its side and lays its curious left eye upon us.

Because I'd like to see one, I ask Manu whether he thinks there might be any marlin. He answers, *Inshallah*, and laughs. His laughter rumbles through his body, all three hundred fifty pounds