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Roberto Casati

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Roberto Casati

Introduction: Sailing Minds

Sailing is and has been with us for thousands of years, and it will be with us for as long as there are oceans and winds for us to travel through. Much has been written about its history, about the law of navigation, about its anthropology, about navigation techniques. Can we gain a fresh perspective on it, a viewpoint from the inside, by asking theoretically minded sailors? This is the key idea behind this collection: inviting philosophers, cognitive scientists, and humanities scholars who happen to sail, and asking them to write a short piece on what they perceive to be the intellectual complexities of sailing.

"The intellectual complexities of sailing" was meant to be a very broad assignment. Many of the scholars around this table do not study sailing directly, but have been intrigued by the exceptional intellectual context provided by their own sailing practice – the challenges of the open seas, the peculiarities of that wondrous artifact which is the boat, the fascination with that alien environment which is the ocean, orientation and wayfinding in extreme conditions, environmental awareness, human factors and human interaction, the language of sailors, bodily feelings, spatial cognition, perception and action under pressure.

Interest in this peculiar human-artifact-environment interaction can lead to unexplored research paths, and scientifically-minded sailors are in a unique position to open new paths. Sure enough, some interesting theoretical breakthroughs have been provided by observing sailing practices – one example above all, Ed Hutchins' introduction in cognitive science of the concept of "distributed cognition" (Hutchins, 1995) – but, in times further past, sailing has both fueled philosophical metaphors, from Theseus' ship to Plato's image of the intellect as the boatperson of the soul, and inspired philosophers' views about our relation with the elements, as happened to Herder during a stormy sea trip (Scholtz, 2016).

The ecology of sailing is highly constrained: sailboats move at the surface between a compressible fluid and an incompressible fluid. Wind originates in certain specific circumstances, as do waves. Only certain sequences of actions are possible in order to take advantage of this ecology. The *ontology* of sailing must comprise heterogeneous items such as the boat, the ocean/wind system, the sailor, the coastline. It highlights the fact that, for centuries, sailboats have arguably been the most complex technological artifacts in each of the cultures that developed them, precisely because the environment they are engaging with is so peculiar and demanding – so alien, in the sense that it is almost the precise dual of Sapiens' adaptive environment: no fixed landmarks, no stable, walkable ground, a narrow horizon, undrinkable water, no shelter from the rain, the sun, the wind.

Sailing practice has evolved with technological progress and has fed back into it. Long-range navigation in the open seas required highly specialized theoretical skills (Wolfschmidt, 2008). Navigation involves planning, constant monitoring of progress, and coordination between crew members. The individual/social epistemology of sailing includes topics such as trust in others' capabilities, trust in ones' senses in the constantly changing environment, coping with disorientation and seasickness, the necessity of relying on highly theoretical knowledge about tides, currents, winds, and of facts about astronomy. Epistemological problems, if not specific, are particularly acute in the navigation context, and co-evolved with the use of technical artifacts: at first oral or written verbal instructions, later iconic representations of various sorts, then maps and eventually GPS-assisted navigation have given rise to problems of interpretation, of truth, of accuracy, of usability, and, nowadays, of over-reliance (Huth, 2013). Navigation instruments such as the compass and the sextant are extraordinary solutions to the problem of generating knowledge in conditions in which the production of knowledge is under constant threat. Embedded/extended

2 - Draft of the introductory chapter of *The Sailing Mind*, R.Casati ed., volume 19 of *Studies in Brain and Mind*. Springer, 2022. ISBN: 9783030896386 ; DOI: 10.1007/978-3-030-89639-3.

cognition are handy options for describing these interactions, but more should be known of the precise mechanics of the interactions between mind, artifact and environment.

Boats themselves are bundles of constraints – arguably, this being a price to pay for guaranteeing relative freedom of movement in a demanding, unforgiving environment. These constraints percolate through practice and affect even the use of language: sailing evolved a highly idiosyncratic, specialized language, that minimizes ambiguities to make communication robust in a noisy environment where multiple perspectives need integration. Ambiguities of a directional term such as ‘left’ are potentially dangerous: my left hand, your left hand, the boat’s left side, that island’s left side, our left when we sail South, to the left of the wind – use of ‘left’ gets differentially lexicalized in maritime parlance.

Action and perception are further challenged by the movements of the boat; embodied cognition acquires a specific aspect in sailing practice. Seasickness at one extreme, more generally the boat’s rotation freedom on three axes, its progress in the frames of reference provided by waves, currents, the wind and the coastline respectively, force sailors’ sensorimotor system to cope with a rich kinematics and dynamics. What do they perceive, how is their body image mobilized, do they have an extended body representation of a large boat as one may have of a bicycle one rides, how do they exert their sense of control, how is attention engaged in the all-absorbing task of helming? Probably it was no coincidence that (Csikszentmihalyi, 1990) introduced the concept of ‘optimal experience’ and ‘flow’ through mention of the sailing experience: “it’s what the sailor holding a tight course feels when the wind whips through her hair, when the boat lunges through the waves like a colt – sails, hull, wind, and sea humming a harmony that vibrates in the sailor’s veins”.

In the words of Ed Hutchins, sailing is a ‘bottomless domain’: the more you learn about it, the more you discover you still do not know. Sailing requires a long apprenticeship, and learning to sail, as all sailors will confirm, is a never-ending process, like playing a music instrument or perfecting an art. The organization of the sailing learning is sensitive to the complexity of the activity and the environment, and on top of the physical engagement with the boat and the elements, relies not only on formal instruction but also massively on narratives and anecdotes; why is it so?

When sailing, a number of frames of reference are available and active for the helmsperson. The pilot’s body, bodies of crew members, the vessel, wave direction, wind direction, true North, magnetic North, distant coastal landmarks, ephemeral landmarks such as cloud lines, stars, other vessels, the orientation of the wheel/tiller, and graphical frames for each representational instrument or support (compass, GPS, map, wind instrument). Negotiating a path, both second-by-second (helming) and on longer distances (routing), incessantly requires some integration of information available on multiple frames. The order “pass the blue boat over there to *its* port side” sets a course of action that involves interpreting the command, changing one’s route considering the relative positions of our boat and the port side of the other boat, monitoring change and progress – especially as both boats move – acting on the wheel, changing the shape of the sails according to the new angle to the wind, maintaining/adjusting the shape of the sails over time and under accelerations imparted by the interaction of the vessel with waves; all this keeping an eye on the environment and monitoring one’s posture to keep balance on the highly unstable boat surface (Tenbrink & Dylla, 2017).

Confronted with this computational load, sailing practice, implicitly or explicitly, often makes one rely on *representational shortcuts*. A representational shortcut reduces the complexity of the computation by reducing the input’s complexity, at the same time maintaining or sufficiently approximating the full functional equivalence of the new computation with more complex ones to the same effect. An example is the constant monitoring of the shape of the sails to keep a course. For instance, in close haul, sails are kept at their power limit to maximize trajectory gains. If the limit is approached the jib starts flapping. This turbulence is interpreted as a symptom, and a

3 - Draft of the introductory chapter of *The Sailing Mind*, R.Casati ed., volume 19 of *Studies in Brain and Mind*. Springer, 2022. ISBN: 9783030896386 ; DOI: 10.1007/978-3-030-89639-3.

(hopefully small) steering correction ensues. The changing shape of the sail is a physical recapitulation of the sail-wind interaction. When you see the sail change its shape, you know that the interaction is evolving. Taken as an indicator, the shape of sails can be considered a cognitive “naturefact” (Heersmink, 2013). It replaces another set of computations, which include checking the wind instrument, checking the compass for route, and integrating the results of the two checks.

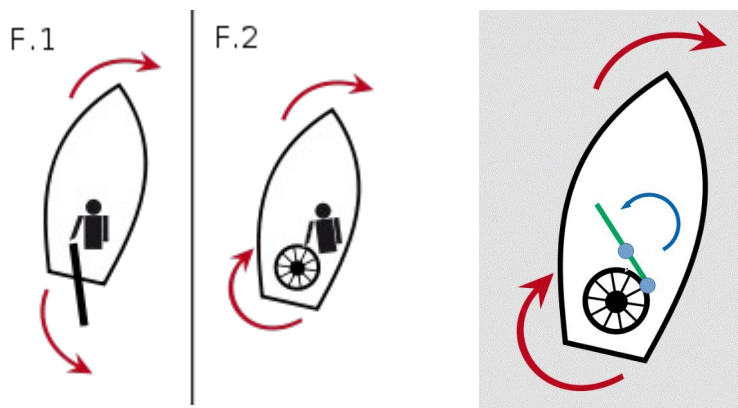
If in some cases, sailors use simplifying shortcuts, in others they *add* imaginative detours, and this may let us reconsider some simplistic readings of claims about the extended mind. When sailing downwind in running point of sail (wind comes from the back of the boat), one can hoist jib and mainsail on the two opposite sides of the boat (goosewinging or wing-on-wing). This set is unstable as each deviation from the course diminishes the pressure on one of the sails. For instance, if running downwind on starboard (main winged out to port, i.e. the left side of the boat facing the direction of movement), whenever we head down (turning to leeward), the mainsail loses pressure and eventually the wind flows on its back. The situation is potentially hazardous as it is conducive to an involuntary jibe, the boom can sweep the deck and the boat can subsequently broach and become hard to steer, not to mention damage to the mast or to the crew.

The inherent instability of goosewinged sailing is compounded by the presence of high waves, whose negotiation forces continuous course corrections by the helmsperson. The helmsperson must compensate the change of course but at the same time she also has to pay attention to the shape of the sails to avoid the involuntary jibe and has little spare attention for checking the compass. However, the shape of the sails is here an indicator of direction, that she can use reliably. It is a simple and effective representational shortcut. The shape of the sails in a sense summarizes the situation of the boat relative to the wind, and sailors are trained to spot the slightest variations and changes in their shape. What about the course correction when sailing goosewinged? On small sailboats one can implement a nice *representational detour* (I was taught this by sailing instructor Giorgio Tognocchi), in which the tiller becomes a pointing device: point it towards the sail that is losing power, is luffing and in danger of jibing, and *imagine the tiller works as a hairdryer* (Practice 1). Air from the tip of the reconceptualized tiller will imaginatively “inflate” the suffering sail. The physics behind this situation is simple. The mainsail in our example (on a starboard tack) lost power because the boat was heading up on the port side (i.e. it was “turning left”), getting more and more wind from the port side. In order for the boat to turn right, the tiller should then be moved to the left. Thus, it would appear to point to the underpowered mainsail. At this point, the wind takes care of restoring power to the mainsail.

This sequence requires some training to be performed efficiently, but both the indicator function of the sails’ shape and the representational redescription of the tiller as a hairdryer, as well as the imagined causation (inflating the sail thanks to the tiller) stick in the practice and organize it. Here, the opportunistic mind of the learning sailor heavily relies on the regularities of the artifact to diminish the huge representational set of inferences that would require too much time in the situation (just reread the complex sequence above.)

But here is an interesting twist. Some boats have a tiller, others – larger ones – have a wheel. And if the gesture that turns the boat to the right on the tiller is contralateral (pushing the tiller to the left), the gesture on the wheel is ipsilateral (turn the wheel to the right). So if you learned the hairdryer trick on a tiller sailboat, you must unlearn it on a wheel sailboat! (Typically, when you upgrade in life from small sailboats to cruisers.)

But why unlearn? Here (Practice 2, personal experience) you can retrain yourself by taking advantage of your learned sequence. I just imagine the wheel to command not the rudder directly, but a virtual tiller-hairdryer joint to the wheel in front of it and hinged in the middle. Thus, anytime I steer to the left, the virtual tiller-hairdryer will point to the right, and conversely.



Left pane: In order to turn to starboard, the tiller must be moved to port (contralateral), and the wheel to starboard (ipsilateral). Right pane: the virtual tiller (green) is imagined hinging on the wheel and on the boat, so that the movement of the wheel generates a contralateral movement of the imagined tiller. At this point the enhanced “hairdryer” representation is effective.
Source: https://upload.wikimedia.org/wikipedia/commons/thumb/b/b3/Tiller_and_helm_orders%2C_1912.svg/200px-Tiller_and_helm_orders%2C_1912.svg.png
Right pane: redrawn by RC.

The interesting element of this story is that I use (I still do, after so many years, when doubts arise) a purely mental representation of the tiller in order to avoid retraining myself to the use of the wheel. The imaginary tiller is simply not part of the ecological scene. But this representation satisfies many of the standard requirements (Sprevak, 2019) used in the “offloading” discourse that allegedly diminishes the role of internal representations. Actually, both the real tiller of practice (1) is representationally enriched and redescribed (as a hairdryer) and its enriched representation is operant in the imaginary tiller of practice (2). And effectively so, as it saved me the work of retraining myself in the use of the wheel.

The powerful representational shortcut of the shape of sails invites the “offloading” metaphor. But from the fact that a certain representational artifact, or a certain naturefact, takes away the cognitive load from the cognizer, it does not follow that it performs the cognitive operations it takes away (which is what happens when you offload driving to a cab driver – the driver does precisely the work you don’t). At least, it takes quite a bit of arguing to claim that the artifact or naturefact does cognitive work ((Hutchins, 1995) claimed that maps “precompute” routes).

Whatever the fate of the argument in favor of offloading, the hairdryer imago is a bit of an antidote to the offloading metaphor. The *fictum* is an essential computational ingredient of the steering operation. In lieu of a mind that literally “extends” to actually external physical items, we have a body that is imaginatively extended into an imagined object performing an imaginary operation. In order to take advantage of the shape-of-sail representational shortcut, one could of course mint and follow an explicit rule: “if you see the sail on the right (be it job or mainsail) become underpowered, steer towards the left,” or more generally, “steer contralaterally relative to the underpowered sail”. One thing that strikes me is the resilience of the *fictum*, the imagined representation. After years of sailing, I still feel as if the tiller-hairdryer was blowing into the sail, or (although, to a lesser extent) as if the wheel was commanding an imaginary tiller blowing into the sail. It is as if the simplicity of the process involving the imaged representation blocked the onset of the implicit learning one acquires by repeating the correct gestures thousands of times.

Imagination is to be found in other provinces of sailing. Sure enough, imagination is an enemy to be tamed when it takes over perception- and knowledge-based decision making; long days in the doldrums, waiting for a whisper to get the vessel going, are associated with instilling negative visions and eventually with developing insanity. But in other circumstances imagination is once more a computational ingredient. A much discussed and insufficiently understood example is the “moving island” (*etak*) technique of Micronesian navigation (Lewis, 1994), (Hutchins, 1983) .The

5 - Draft of the introductory chapter of *The Sailing Mind*, R.Casati ed., volume 19 of *Studies in Brain and Mind*. Springer, 2022. ISBN: 9783030896386 ; DOI: 10.1007/978-3-030-89639-3.

navigators referred to invisible (because below the horizon) islands (actual or artificially concocted ones) whose imagined location was used to keep track of progress against the patter of rising and setting stars. The issue that intrigues readers of ethnographic reports is how a non-visible, inaccessible entity can figure in an explanation of wayfinding, in particular of vision-based wayfinding. How could micronesian navigators navigate using etak, i.e. imagined (or real but invisible) islands? In order to understand how etak-based computations works, consider the following environmental analogy: "It is rather like sitting on a train and looking out the window. In your little world you sit and talk while the scenery slips by. In the distance there are mountains which for long periods of time seem to pace the train. Looking at them you are distracted by nearby houses which flash backwards between you and the mountains. The mountains are the stars and the houses the islands below." (Gladwin, 1974). The procedure tracks progress by parallax to very distant landmarks (Hutchins & Hinton, 1984). If there were real islands between you and the stars, you would see them "move back" relative to the stars as you progress. But the hard question remains on how you can get the parallax of something you do *not* see. The solution is in the visible stars. Etak islands are imaginative *star markers* for assisting dead reckoning. They are not used *directly* for computing *position*; this computation is done elsewhere, and it requires a large number of independent and superposed techniques and knowledge (Lewis, 1994), such as interpreting swells, winds, patterns of bird flight, color and temperature of water, drifting objects, mastering one's boats features, and using the sky for directions, in a delicate pattern of constraint satisfaction. Imagining an invisible island below the horizon on the vertical of a given is then a star marking device that comes *after* the dead reckoning computation to remind the sailor of progress made, the marked star being then used as an *input* to dead reckoning during the subsequent leg. Other imaginative devices could have been used, such as, say, projecting a mental halo on the star to be marked, but they would have been disconnected from the experiential practice of parallax, that in turn could well have arisen by observations made when sailing by real islands¹.

The collection of essays in this volume reflects a relatively specific perspective on sailing, that of recreational or sport sailing in Western waters and cultures. Much more of course should be said about the many sailing practices that are today or have been in the past in use in other parts of the world, where sailboats could have different economic significance, being used for e.g. fishing or shipping, where environmental conditions (winds, currents, shape of the coast) have their own peculiarities, and not only boats, sails and riggings are or have been of different design, but also the availability of infrastructure and craftsmanship could vary considerably. At the same time, some fundamentals of sailing are determined by the same invariants in all cultural contexts; the physics of winds and water and of floating bodies, and the cognitive and bodily capabilities of sailors, constrain the range of variation in techniques. Thus, it is expected that at least some of what is described in this volume will generalize to many other sailing contexts. In the end, sailing has hidden intellectual complexities, and this is what allows it to provide an intriguing viewpoint on many human activities and representations. It goes without saying that the specific perspective investigated in this volume is necessarily partial, as any perspective is. There are other complexities of sailing that are certainly worth mentioning, but whose critical treatment is beyond the scope of this volume. If historically sailing has been associated with adventure, discovery and technical innovation, it has also been instrumental in the human colonization of the planet, and in the reshaping of cultural influences and patterns of domination; male figures are prominent, perhaps stereotypically, in the history of Western sailing, and only as of late the sport is addressing population biases, giving a yet too timid place to underrepresented communities.

The anthology opens on a piece by Daniel Dennett on the adage that if one cannot control the wind one can trim the sails – being in control requires knowledge and access to information, but it also

¹ Arguably, the practice of naming stars could have started in navigation. Even today, in navigations on the high seas, stars get ephemeral names used to assist helming and coordination between crew members (Casati, 2019).

6 - Draft of the introductory chapter of *The Sailing Mind*, R.Casati ed., volume 19 of *Studies in Brain and Mind*. Springer, 2022. ISBN: 9783030896386 ; DOI: 10.1007/978-3-030-89639-3.

requires keeping overthinking in check, and balancing an assessment of the present situation with long-term goals. He tells an enlightening tale about the way his autopilot outsmarted him on minimizing helm adjustments, within a much shorter learning period, but without factoring in the many environmental and informational data and constraints that drive the helmsperson's attention. Our sense of control, in the end, is the key to understanding free will and responsibility, in a human-shaped environment that optimally delegates control to reduce uncertainty and allows for the cultural transmission of strategies.

Wellbeing at sea and on a boat depends on many factors, but one may wonder why it is the case that helmspersons enjoy hours of engagement with the boat and the elements that most people will find demanding to say the least. The above quote by Csikszentmihalyi inaugurated research on "flow", the optimal experience; and although the fluidity evoked by the metaphor is appropriate to the watery environment, the very notion of flow is not fully specified in the literature. Christine Tappolet takes up the task and argues that the experience of flow is a kind of emotion, as it satisfies the conditions definitory of emotional states (possessing a phenomenology, having both intentional and formal objects, involving evaluations and motivations.) This reframing opens the way to a better understanding of flow: if emotions are accounted for perceptually, what is the perception of flow perception of? And if flow is a type of emotion, it is possible to see how it contributes to happiness, construed as a positive balance of affective states.

One of the most paradoxical feelings is the tranquility sailors experience even if they are surrounded by the liquid, unwelcoming environment. Luciano Fadiga makes the perception of the boat responsible for this calmness, suggesting that the feeling is enhanced by the perceived contrast with the element. Equally puzzling is the absence of boredom in an activity that is, by all measures and comparisons, a slow one: most leisure boats hardly go faster than a fast walker. According to Fadiga, the signature of the sensory stimuli available when railing is a high signal-to-noise ratio, something our predictive brain is very fond of; a form of hyperstimulus, like gourmet food.

When the autopilot is off and we enjoy the full experience of helming, our eyes are wide open, but vision isn't the only sense used for sailing. How is multisensory information dealt with by the sailing brain? Alberto Gallace draws a comprehensive review of recent neuroscientific and behavioral findings about perception and multisensory integration, highlighting the role played – mostly in an unconscious way – by less considered modalities such as touch, olfaction, and the sense of balance, and addresses the explanation of the conditions of wellness at sea and, of course, seasickness. If many of the findings are not specific to sailing, and if sensory impairments do not prevent sailors to be proficient, multi-channel integration is at the heart of the issue. The boat/body/water interactions evolve at many temporal scales, and only a long, dedicated training and exposure to the environment makes sailors proficient in their reliance on multiple sensory inputs. Seasickness – when sensory integration breaks down dramatically – is there to remind us of the formidable challenges of aligning our senses on a boat at sea.

As every novice will be eager to report, the physical and sensory challenges of the initial steps of sailing are difficult enough; but mastering the terminological jungle is felt as absolutely prohibitive. A modern 30-foot sailboat may contain thousands of *types* of components, and although most of their names are only known to naval constructors and ship-chandlers, quite a few of them are needed to refer to the parts that are most used in sailing. There is an aura of snobbery in all this, as Massimo Piattelli-Palmarini observes in his cross-cultural contribution, and the seemingly capricious renaming of commonsense notions such as *left* and *right* appears to be designed to repulse many would-be sailors; but the communication advantages of unambiguous naming are obvious in hectic, noisy contexts. Piattelli-Palmarini shows, by comparing the English, French and Italian technical languages, that each incorporates a perspective, a viewpoint on the practice.

7 - Draft of the introductory chapter of *The Sailing Mind*, R.Casati ed., volume 19 of *Studies in Brain and Mind*. Springer, 2022. ISBN: 9783030896386 ; DOI: 10.1007/978-3-030-89639-3.

The study by Thora Tenbrink tackles the issue of top-down influences on spatial perception by sailing expertise. Using a questionnaire submitted to sailors and non-sailors, she is able to show that the two groups attend to different aspects of the same situation shown in a video, and use different ways to refer to those aspects, reflecting the difference in concepts available to them, where sailors prefer technical notions when they are relevant. Interestingly, sailing appears to affect the sailors' apprehension of spatial situations in non-sailing contexts, in particular environmental awareness of landmarks and of winds.

Attention is what it is all about; the sand desert may be *hostile*, but the sea is an *alien* environment, rewarding but unforgiving, impossible to approach without constant focus on its ever-changing details. We are never close enough to it for learning about it and from it, claims David Papineau, whose plea for small sailboats, which offer a privileged point of view on and sustained engagement with water, is cum-substantial with a passionate description of the details of the sea and river environments the sailor can thoroughly and intimately get to know.

Our brain evolved in rich, complicated, even luxuriant environments; the sailing stage – sky, water, waves, clouds – is more austere but not thereby unstructured, and it offers effective if subtle *affordances* the sailor can learn to harness. Robert Matthews focuses on racing contexts, which exacerbate the need of immediate reactions with far-reaching consequences. Situation awareness builds upon the ability to perceive affordances. Situation awareness – perceptual, action-targeting and modulated by an awareness of long-term goals – is what distinguishes experienced and professional racers from novices. Affordance perception is not a simple matter of sensory coupling with the environment: illusions of affordances explain why certain sailors get themselves into complicated situations, and are in turn related to different levels of expertise and of assessment of one own's capabilities. Risk taking is part of the game and it too shapes affordance perception and benefits from it. Skilled skippers appear to avoid high risk/low reward action, and take low risk/high reward actions “without hesitation”.

Boarding a boat is a risk-taking endeavor in itself, even more so when remote sailing is involved: hundreds of miles from shore, away from naval infrastructure, and beyond the reasonable possibility of rescue. Special, tailor-suit insurance is needed for offshore sailing, if at all available. The most practical thing to do in order to assist a sailor in distress during offshore regattas such as the Vendée Globe, is to reroute the nearest participant to their help, as it has happened time and again in various editions of the race, bearing in mind that “near” could mean days of navigation in extreme conditions. How are we to think of risk-taking at sea, in particular in remote sailing? In Ophelia Deroy's account, experienced sailors are better at evaluating (or just accepting the possibility of) compounded risks, which are the major source of serious accidents, and, if the situation evolves negatively, they both accept ambiguity and the difficulty of estimating probabilities and head towards avoiding the worse case scenario, i.e. damage to the boat. The boat itself, for Deroy, is the centerpiece of the sailor's attitudes and provides the indispensable comfort that repays and sustains the risky activity of sailing.

It is often said that more people have been on spaceships than solo around the world on a sailboat; most sailing is performed by crews, that must work in concert. According to Frances Egan, this requires them to adopt and maintain a *we-perspective*, framing their thoughts in the first person plural. The crew perform joint actions, mediated by the boat, where someone's steering is modulated by and modulates someone else's trimming or easing out the sails, towards a shared goal such as, say, keeping a route or gaining speed to overcome a competitor. The *we-perspective*, that includes the experience of *we-emotions*, is conducive to encouraging each individual's best effort in challenging circumstances, and generates entitlements to appraise and influence other crew members. Assembling a good crew is an art in itself; people come with different profiles, and must flexibly fit into various roles; if a plural subject is most definitely more than the sum of its parts, cementing the team is constant work in progress. And as Egan reminds, the most difficult and trying

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conditions in a race are those of light air – nothing seems to ever happen, technical skills are under stress, and cohesion is threatened.

In sailing we learn by doing and by formal instruction on board and on the shore; today textbooks and tutorials abound to explain maneuvers of all types. But this codified body of knowledge covers only of a fraction of the diverse situations that may occur at sea. Where can one learn about them? As many authors in this volume agree, conversations at the tavern on the pier appear to be an inseparable part of training, even if they are not marketed as such. Their content is mostly personal anecdotes and narrations. Now, anecdotal evidence is generally considered of low epistemic quality; science abhors it, as a signature of lazy and unfinished work. There are two main issues here. One is the reliability of witnesses, whose storytelling abilities can only be useful if the circumstances they describe are relevant for training. Trust in the report of witnesses is an important epistemological issue that gets specifically modulated by what we observe in sailing, as Nicla Vassallo reminds us. The second issue is the use of anecdotes as opposed to other more formal types of communication. A hypothesis is that the endless narration of anecdotes has a *signaling* function: they indirectly hint at the vast unpredictability of sea conditions and at the complexity and inherent fragility of the vessel.

More structured, but contextually sensitive feedback is provided in the de-briefing meeting at the end of a training session (of a race, of a crossing). Anna Oddone documents and analyzes the practice in the peculiar context of a proof-of-concept sailing initiative which by design leverages the diversity of the crew in order to show the liberating power of inclusiveness, both at the personal and the collective level. The de-brief, structured by the skipper, fulfills many functions: informing, aligning crew knowledge, but also cathartically easing pressure, making thus possible to acknowledge what is good in others and what can be improved in us.

Randy Gallistel traces back his study of animal navigation to his fascination with sailing and the need to reliably orient oneself when sailing close to the coast, when navigation errors are the most dangerous. He reviews the breath-taking series of researches on insect (in particular bee) navigation of the last century and the controversies around the notion of cognitive map. (In a minimal reading, cognitive maps are the best explanation of certain types of animal navigational behavior such as being able to find shortcuts and detours through places the animal has not visited.) He defends the mechanistic aspect of explanations based on cognitive maps – here interpreted as metric vector spaces in neural tissue – against a number of objections, proving that navigation in academic waters is not without analogies with negotiating winds and currents at sea.

Describing navigation techniques that predate the use of GPS, on sailing boats that have no onboard engine, François Hartog introduces the concept of “time at sea” on long sails, a way of apprehending temporality on a boat, breaking with time on land. It is paced by watches, miniature days and nights that optimize effort and efficiency of the crew, and is dynamized by the necessity to cope with the constant updating of meteorological, tides and navigation conditions; this in turn creates new temporal cycles of observation and recording on the logbook. At some point the skipper steps back and prioritizes the various parameter, thus displaying Ulyssean cunning intelligence, *métis*, the as navigation is under the responsibility of Athena, not of Poseidon the master of the sea. Navigation techniques evolve, but the open sea will always be a demanding, unforgiving environment, and good judgment will be always requested to cope with its strength.

But at the end of the day, no matter how troubled the sail was, each of us would like to focus on the final task of the cruise, dropping the hook in the perfect cove, looking forward a moment of rest, of sharing of memories, and perhaps contemplation. Not so simple, reminds us William Sharpe, for whom the mind of the mariner preparing to anchor is divided in three parts, one studying the water surface, winds, currents and obstacles, one thinking about the invisible bottom and its uncertainties, and the third – the social mind – “repressing awareness of critical onlookers”, so as to let the two

9 - Draft of the introductory chapter of *The Sailing Mind*, R.Casati ed., volume 19 of *Studies in Brain and Mind*. Springer, 2022. ISBN: 9783030896386 ; DOI: 10.1007/978-3-030-89639-3.

other parts do their job. The anchoring part of sailing is so important (how to impede the movement of an artifact that was designed to ensure maximum slipperiness) that it is the source of countless metaphors; these in turn cast a light on the mind of sailors, on the way they apprehended the medium that makes sailing possible, reminding them that humans are not inhabitants of the sea, and that they need to touch land, sooner or later.

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