Am I autistic?

An intellectual autobiography

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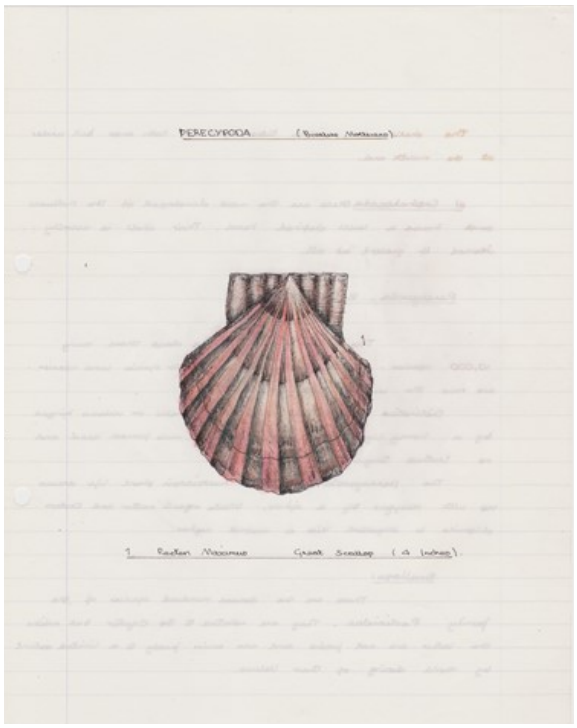
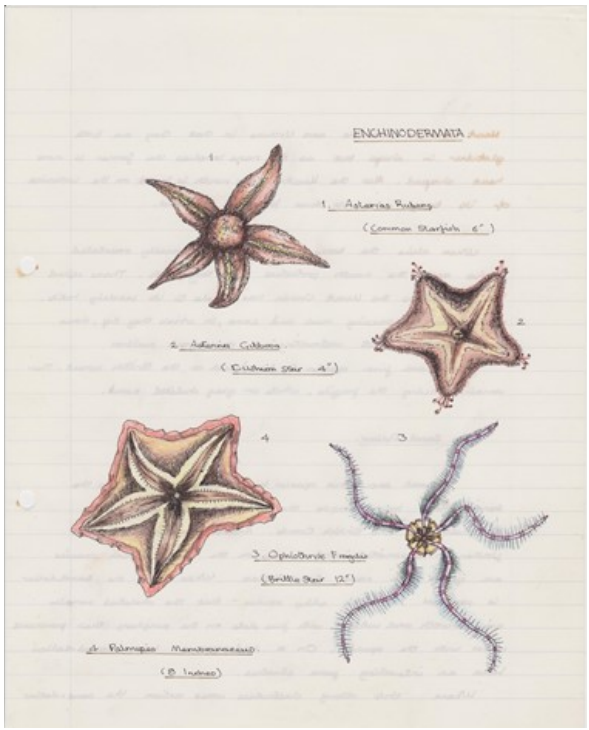
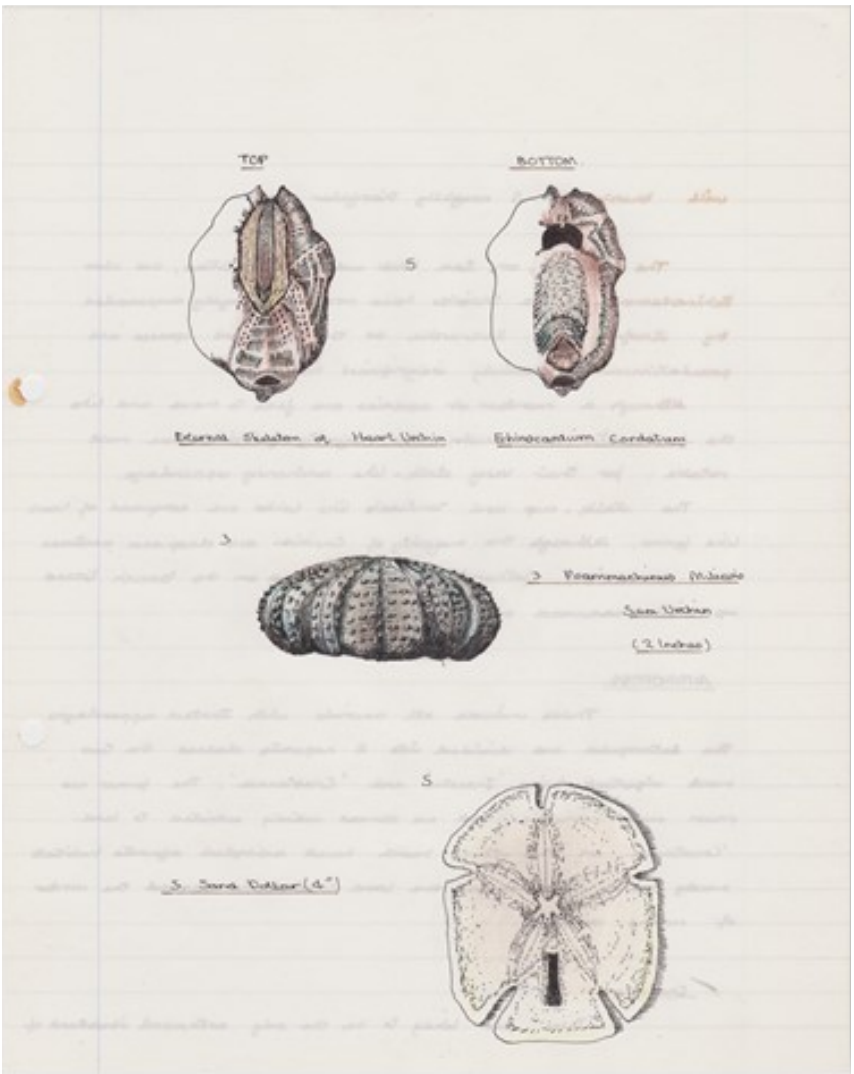
What follows are some personal notes that were inspired by answering the first question for *ALIUS Bulletin*. In looking back at my life, I can see some distinctly autistic traits in my childhood—and indeed current ways of engaging with the world. For example, I religiously avoid mobile phones and do not Skype. In fact, I find any disruption to my weekly routine rather nerve wracking. Unhappily, this means travelling to international conferences can be unsettling—where I spend most of the time avoiding other human beings; especially in the morning. Curiously, I feel most at home with myself when lecturing "onstage"—close to lots of people who are, at the same time, comfortably distant.

When reflecting on my early (academic) experiences, similar themes come to mind. I was obsessed with the natural world and would commit to recording it in a somewhat obsessional fashion: see, for example, the illustrations of aquatic flora and fauna that decorate these notes. I must have spent hours on these for a school project—at the expense of actually learning what I should have been learning.

I am not pretending that I was autistic; however, I remember being assessed by educational psychologists on several occasions. The first (at age 5) was a mildly traumatic experience that was meant to resolve a confusing relationship with my teacher. This educational intervention led to my withdrawal from the state education system and I was sent to a private school run by Catholic nuns (where I flourished). The second was more amusing: I remember being asked whether I thought the puppets in Thunderbirds ever got hungry. I recall thinking at that time "what on earth does a psychologist expect me to say?" After several levels of recursive sophistication, I opted for "yes". The third encounter with a psychologist followed a science project when I was 10 years of age. I had designed a self-righting robot—involving mercury levels and feedback actuators that would enable a little robot table to traverse uneven surfaces (a useful endeavour that set me in good stead to understand the notion of feedback, optimal control, and in later life, cybernetics). The psychologist wanted to know how I came up with the idea. I somehow knew she


PERECYPODA
1


ENCHINODERMATA
1
2
3
4

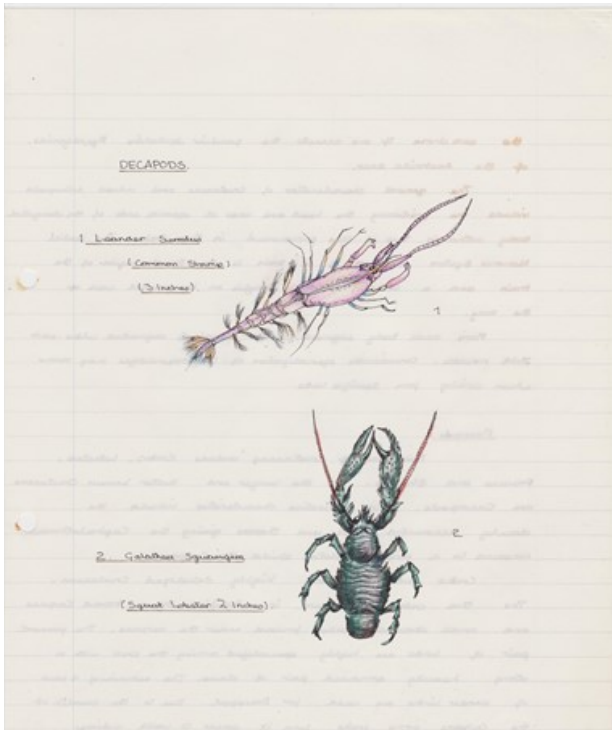

TOP
BOTTOM
5
3
5

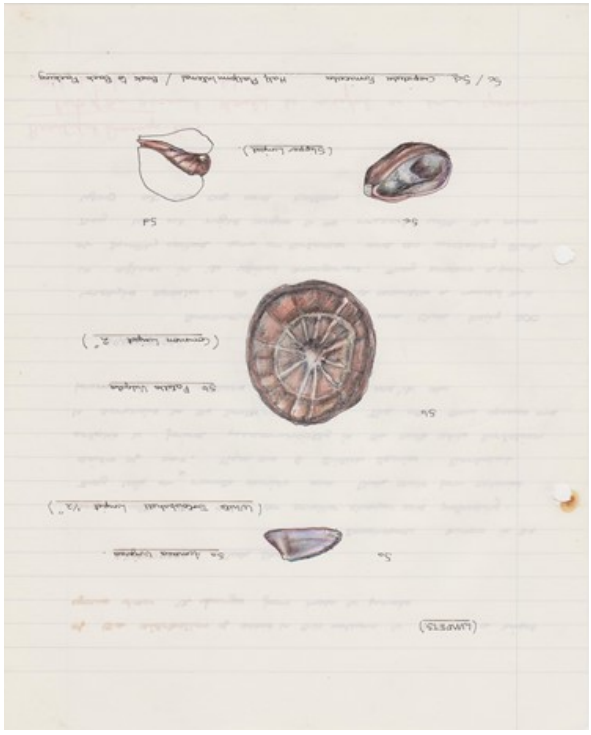
was more interested in me than robots *per se*. Shortly afterwards, something happened, which I want to write down before I forget it: on walking to primary school every day I had to pass the grammar school students waiting for the school bus. I recall thinking: "one day, I want to be in that queue" and then, more poignantly, "I must remind myself about this moment when I am grown—so I do not forget the insight, ambition and sophistication of childhood".

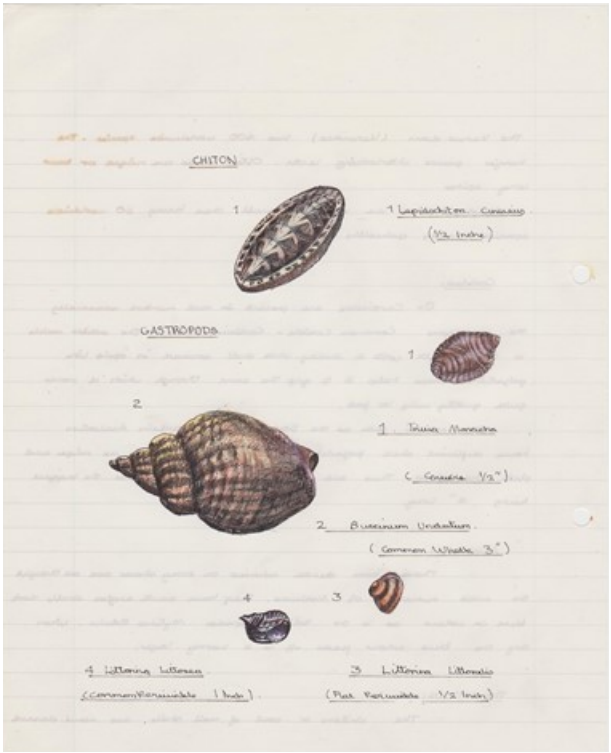
Throughout my education, my primary sources of self-esteem were largely drilling down into an area or problem in a somewhat perfectionist fashion and deriving a delightful sense of comfort in isolating the problem domain—that felt like my little world. My teachers seemed to know this and used to play games with me. One of these games (of which I was most proud) was to see if I could derive answers to A-level questions in mathematics—that were more parsimonious than the worked answers supplied by the examination boards. I recall being obsessed by mathematical issues and enormously pleased by their resolution. One of my favorite achievements was being able to derive Schrödinger wave equation from scratch. My reward was to take the physics class while my physics teacher (Ged Proctor) amused himself in the stockroom (I don't know how, because his primary passion was Morris dancing).

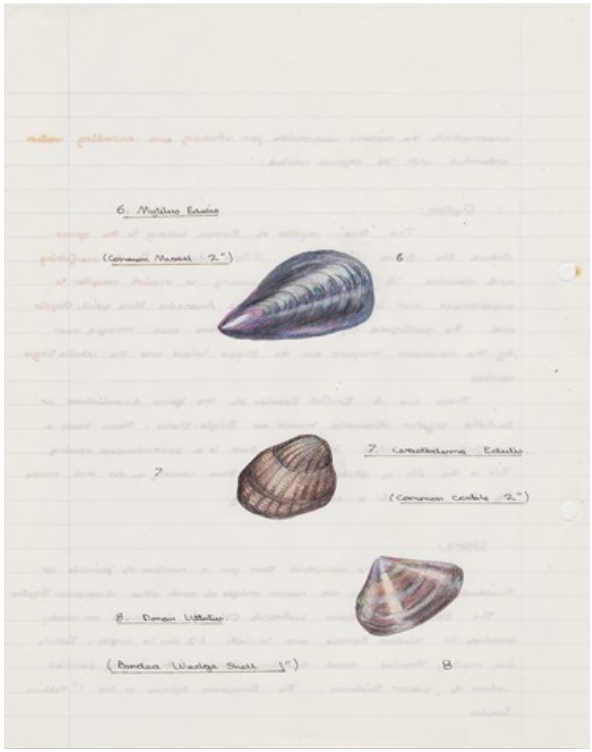
I do not think I was really autistic; however, any unusual traits may have been compounded by my early schooling: my father was a civil (bridge) engineer during an active period of motorway construction in the United Kingdom. This meant that we had to move around the country. By the age of 10, I had attended six schools, and had come to realize that the only constants in my life were my family—and the things inside my head.

This background sets the scene for a series of vignettes that, in retrospect, trace a clear path to the current formulations of the free energy principle. The woodlouse example (see my interview in this issue of *ALIUS Bulletin*) was formative in terms of subsequent exposure to evolutionary thinking. The apparent emergence of purpose from purposeless but "shaped" dynamics made it easy for me to understand natural selection; however, there was a more subtle aspect to the insight that speaks to second order selection. In other words, irrespective of the implicit gradient descent in any optimization process (e.g., natural selection) a simpler mechanism can be in play —without any gradient destroying dynamics. This is simply the fast evacuation of volatile, high-energy regimes of phase-space. In evolutionary thinking, this has often been exemplified in terms of selection for selectability (e.g., the increased mutation rate of *Drosophila* unexposed to a volatile temperature environment). Mathematically, this underwrites generic optimization schemes such as stochastic dynamic optimization. In later life, I often thought about trying to develop this idea in terms of meta-selection—and even ended up using it in the context of active


DECAPODS
1 Leander Serratus
(Common Prawn)
(3 inches)
1
2 Galathea Squamifera
(Squat Lobster 2 inches)
2




CHITON
1
1 Lepidochiton Cinereus
(½ inch)
GASTROPODS
1
2
1 Tritia Monodonta
(Common ½")
2 Buccinum Undatum
(Common Whelk 3")
4
3
4 Littorina Littorea
(Common/Periwinkle 1 inch)
3 Littorina Littoralis
(Flat Periwinkle ½ inch)


6 Mytilus Edulis
(Common Mussel 2")
6
7
7 Cerastoderma Edule
(Common cockle 2")
8 Donax Vittatus
(Banded Wedge Shell 1")
8

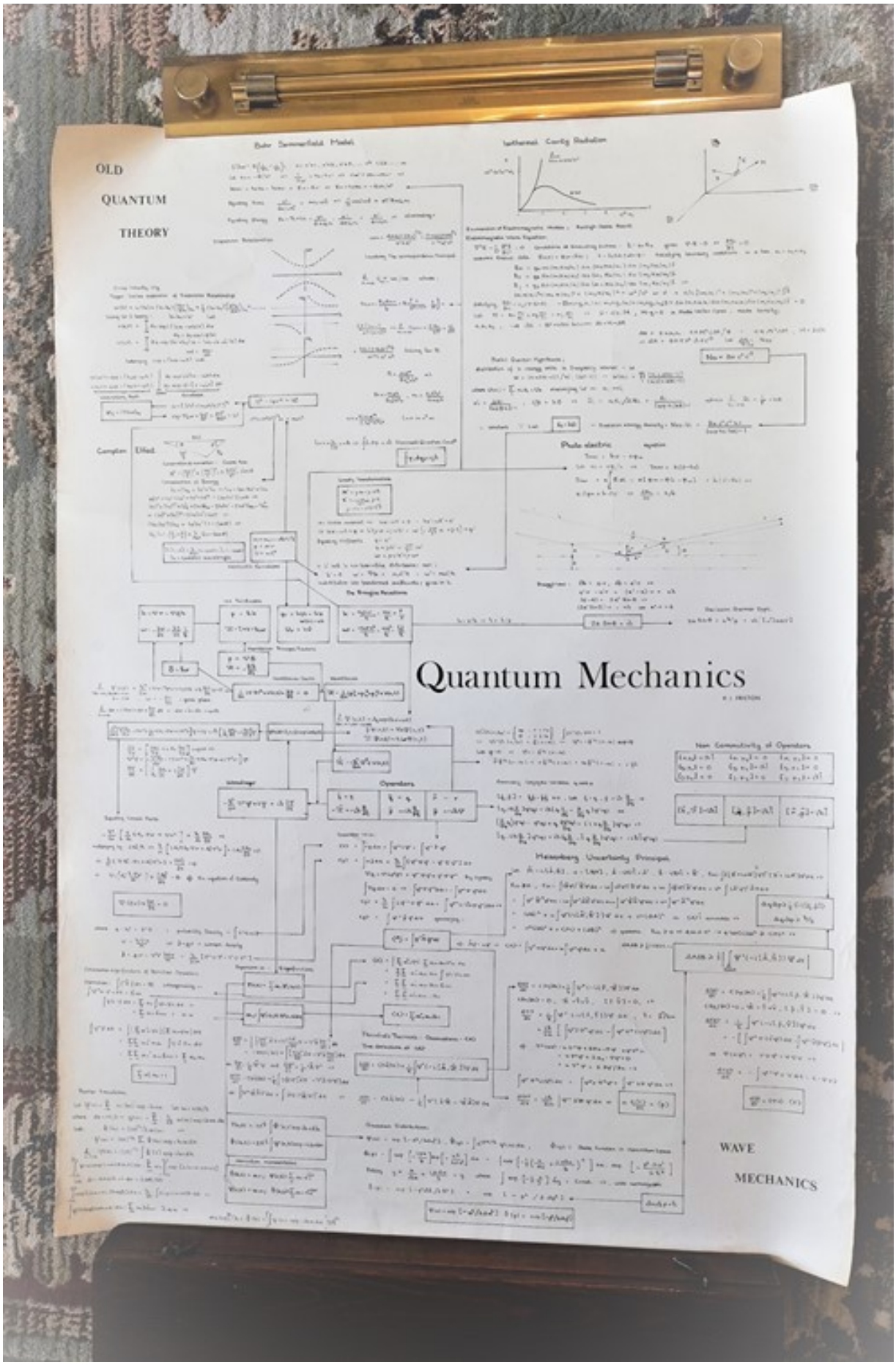
inference; in the form of autovitiation (the destruction of unlikely fixed points by simply moving faster in regimes of high surprise or low probability density).

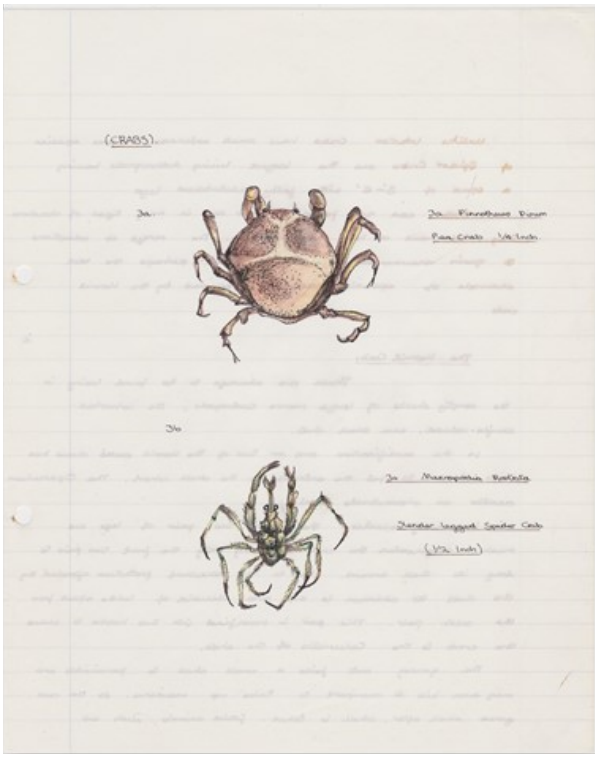
The translation of this sort of thinking into physics started, for me, in my late teens, when I became preoccupied with holistic explanations based on minimal assumptions. I recall spending hours thinking furiously in my bedroom—overlooking cherry blossoms in the front garden: I was convinced that there should be a singular explanation for the shape of things, just starting from the premise that something existed. My best conceptualization of this was some abstract point in an abstract space that, in later life, transpired to be a point attractor in a phase-space. This style of thinking made it easy to understand dynamical systems theory in terms of attracting sets—and the distinction between different forms of attracting manifolds.

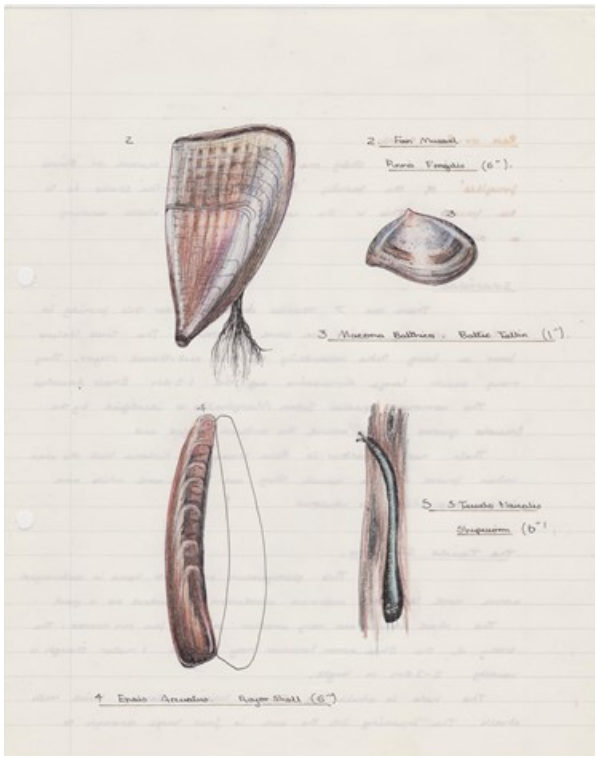
The obsession to put things together came to a practical head in the summer holidays after a year of Medical Science Tripos studies at Cambridge University. I had, with deliberate intent, chosen psychology and physics to pursue for the subsequent years of my undergraduate study. This meant that I had to catch up with the other physics students. I spent an absorbing holiday—to the exclusion of everything else—trying to get all of physics onto one page. I failed—but was able to condense quantum theory into one page (see Figure on the next page). I think that this was symptomatic of an obsessional drive to integration and simplification. Although I forgot nearly everything I had learned during this period, it meant I was not intimidated when taking up these themes in later life—largely by foraging in Wikipedia.

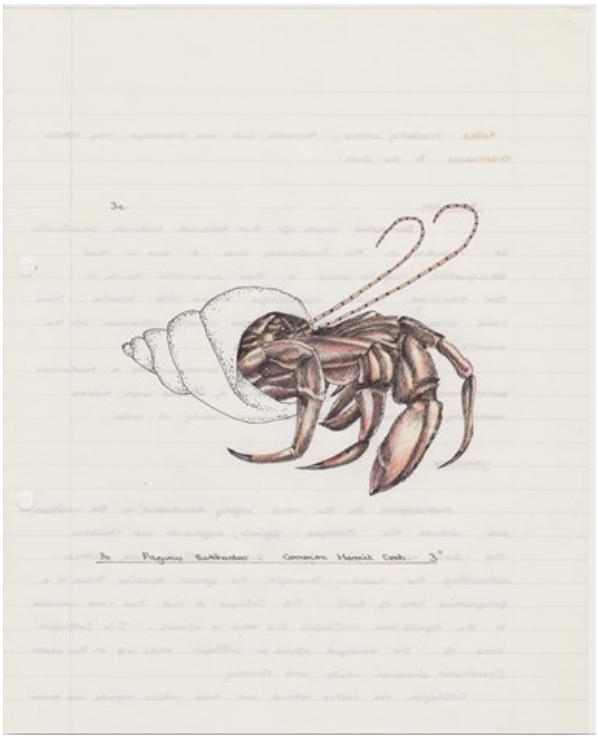
Another memorable episode of intense thinking occurred when on a Christmas break from University, thinking earnestly in the early hours over a nourishing coal fire in the family living room. The conclusion of this contemplation was that all interesting things have to occupy a compact domain of phase-space and must therefore possess an attracting set. The key insight here was that the only invariance that lent "shape to things" entailed correlations. I nurtured this idea for several years (during which I qualified as a doctor and started psychiatric training). I found a peaceful distraction from my job in musing on these issues, while working in a therapeutic community of chronic schizophrenics in an old-style Victorian asylum.

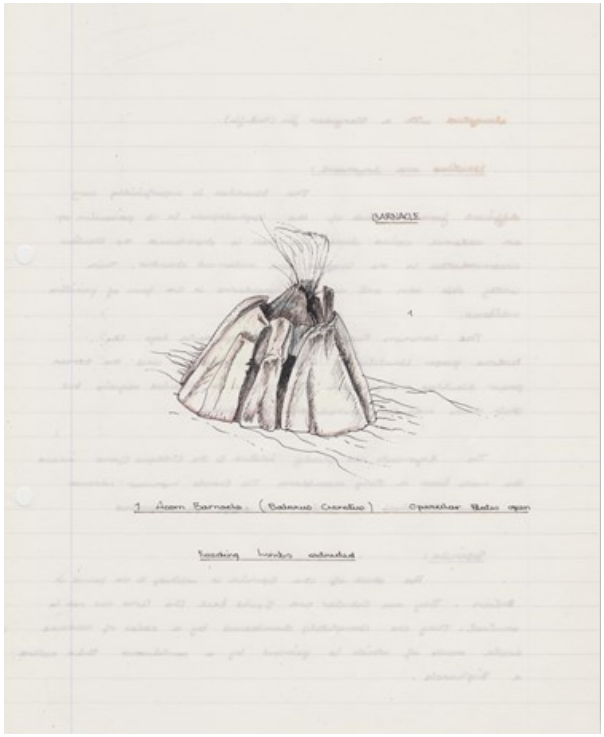
I had, at this point, concluded that statistical invariance (i.e., correlations) had to be transcribed into the physics of our brains—in order for them to possess an attracting set. I found this idea so compelling that I spent an entire Saturday at Blackwell's bookshop in Oxford (where I was training), scouring medical and mathematics books for related ideas (this was before the World Wide Web and Wikipedia). After about three hours searching, I found references to the writings of Hebb and


OLD
QUANTUM
THEORY
Quantum Mechanics
WAVE
MECHANICS


(CRABS).
3a
3a Pinnotheres Pisum
Pea Crab 1/4 Inch
3b
3b Macropodia Rostrata
Slender Legged Spider Crab
(1/2 Inch)


2
2 Pen Mussel
Pinna Fragilis (6").
3
3 Mactra Solidissima . Baltic Tellin (1").
4
4 Ensis Arcuatus . Razor Shell (6").
5 Teredo Navalis
Shipworm (6")


3c
3c Pagurus Bernhardus . Common Hermit Crab. 3"


BARNACLE
1
1 Acorn Barnacle (Balanus Crenatus) Operculum Valves open
Feeding tendrils extended

surprised myself with an ambivalent reaction: intense pleasure that the idea was valid and intense displeasure I had wasted several years on something that was already known. I remember trying to work out how old Hebb was—and whether I could have ever met him. From that point on, I waited patiently until I could get into research proper, at around the age of 28. The next part of the story, from my perspective, can be found in (Friston, 2012).

References

Friston, K. (2012). The history of the future of the Bayesian brain. *Neuroimage, 62*(2), 1230-1233. doi: 10.1016/j.neuroimage.2011.10.004