

## Chapter 2

# Noticing Recurrent Patterns, from Microcosm to Macrocosm

**Abstract** Careful study reveals a variety of recurrent natural patterns of life that are evident over vastly different scales of organization, within living cells, multicellular organisms, colonies, populations, communities and ecosystems: stars and stripes, circles, lines, spirals, rivers, ripples and crazy paving. The vital role of receptive perception and imagination in the personal recognition and appreciation of these patterns is emphasized. The suppression of these qualities by the imposition of rationalistic logic and language that objectively isolates observer from observation is seen to be a source of profound misunderstanding, which detracts from the quality of human life experience, learning and discovery. By contrast, the value is recognized and exemplified of a discerning approach to natural scientific enquiry that incorporates and encourages empathic personal observation and feeling awareness rather than relying completely on the abstract findings, methodologies, theories and truth claims of prior and current authorities. Such an approach to enquiry, which reciprocally combines receptivity and discernment, rather than divorcing them as abstract ‘subjectivity’ and ‘objectivity’, is available to anyone, not just those privileged by a formal scientific education. Most fundamentally it requires *imagination*, awareness of intangible presence and possibility, which is beyond the comprehension of objective rationalization. Its exposition may hence include art and poetry, as well as analytical discourse.

### 2.1 Evolutionary Ecology: The Art and Science of Recognizing and Understanding Pattern, Process and Relationship in the Natural World

My overall aim in writing this book is to identify the recurrent patterns in which life is expressed over diverse scales in natural ecosystems and to explore how a new awareness of their evolutionary origin in the natural inclusion of space in flux can be related to human cultural and developmental psychology. I will explain why these patterns cannot adequately be represented or understood in terms of abstract logic and language that definitively dissociates the material content from the spatial

context of natural systems. Both biological and psychological patterns can, however, readily be appreciated as expressions of natural energy flow and how this both influences and is influenced by mechanical and mental resistance to movement.

Correspondingly, my core theme will concern how the perception of natural space as an infinite, intangible, receptive presence, and of natural informational boundaries as continuous energetic flux, revolutionizes our understanding of evolutionary processes. The *mutual natural inclusion of receptive space and informative flux in all distinguishable local phenomena* enables evolutionary diversification to be understood as a fluid-dynamic exploration of renewing possibility, not an eliminative ‘survival of the fittest’. Self-identity is recognized to be a dynamic inclusion of natural neighbourhood, not a definitive exception from neighbourhood (Rayner 2011a, b).

In mathematical and scientific terms, I will show how abstract Euclidean, non-Euclidean and fractal geometry can be transformed into natural flow geometry through the incorporation of receptive space and intrinsic flux into mathematical figures as flow forms. I will describe how the fundamental principle that energy travels in pulses and resides in circulation applies to all organizational scales, from microcosm to macrocosm. Finally, I will reveal how the discontinuous perceptions of space and boundaries that are deeply embedded in many cultural and scientific traditions have contributed to the emergence of abusive power-relations, psychological distress, environmental damage, and social conflict. I hope thereby to offer a new approach to philosophical enquiry that can enable us to remedy these human problems.

And so, let us commence, with an introduction to my personal approach to receptive enquiry and how this can be used to reveal and gain insights into the recurrent patterns of life that I will be seeking to account for in subsequent chapters.

## 2.2 Receptive Enquiry: Exploring Natural Patterns with Eyes and Mind Wide Open

As an experienced and enthusiastic naturalist, I often lead, or co-lead, ‘nature walks’ for members of the public. These can take place anywhere—not just what are sometimes called ‘sites of special scientific interest’. A local park, a residential street, a bit of woodland, a grassy sward—any or all of these would be suitable. It is not unusual for participants to say something like: ‘I’ve walked past that every day without noticing or appreciating it’. And yet many of those same people will spend a significant proportion of their earnings, and consume substantial amounts of fossil fuel, travelling to somewhere exotic in search of ‘new experience’. What kind of commentary on modern life and education is this? How come we have fallen so far out of touch with our natural neighbourhood?

Over the years of my life, and in the light of my own personal experience of academic education, I have concluded that for deep-rooted reasons, generation after

generation of adult human beings has been prone to teach its offspring to neglect its natural neighbourhood. This is psychologically, socially and environmentally damaging. While computer technology and the Internet have opened up vast learning opportunities, the way they are mostly used has aggravated rather than alleviated our sense of alienation from the world we inhabit. We need instead to start paying attention to what we live our lives amidst in a way that opens us up to the deep and varied lessons that we can learn from it. We need to recover our childhood and aboriginal sense of wonder in what naturally surrounds and includes us. We need to explore our environment with eyes and minds wide open to the insights and understandings it offers concerning our natural origins and needs, instead of imposing our own abstract preconceptions and rules of conduct upon it. And, as I have previously discussed (Rayner 2011a) and will try now to exemplify, we need to use evocative language and imagery to express our findings in a lively, sensuous, appreciative way.

***Never Quite Knowing***

*Life is a creative exploration of renewing possibility,*

*Not a competitive struggle for permanent existence –*

*Poetry, not Prose*

*Improvisation, not Prescription,*

*Tolerance, not Rigidity,*

*A Search for Openings, not Quest for Completion*

.

*Motion in Stillness, Stillness in Motion,*

*Responsiveness in Receptivity, Receptivity in Responsiveness,*

*Energy in Space, Space in Energy,*

*Not One or Other Alone,*

*No matter without no matter*

.

*Never Quite Knowing*

*What's coming next,*

*Preparing for Surprise,*

*Ready to change One's mind,*

*One's direction*

.

*That's the evolutionary learning curve*

*In natural inclusion –*

*Truly natural Science,*

*Truly natural Art*

*Exploring natural neighbourhood with Love*

*Exciting and Inspiring*

*Isn't It?*

(composed on 22nd October 2015, with appreciation of Emily Dickinson, 'I Dwell in Possibility').

The sheer joy of encountering all the diverse and wonderful patterns in which life expresses itself in the natural world, and recognizing how these patterns recur at so many different scales and in so many different situations, has always been my principal reason for loving natural history. This has been a far greater source of inspiration for me than the simple hunter's quest to find and name as many different species of wildlife as I can. Or, rather, it is why I enjoy this quest so much: because becoming good at it requires me to learn to recognize what is known as 'jizz'—recurrent patterns of appearance as basic underlying 'themes' expressed in myriad 'variations'. This same intuitive ability is what enables us all to come to recognize a familiar human face, regardless of its expression and hairstyle and without need to pause for analytical thought.

It is the recognition of those underlying themes in Nature that brings me the most entrancing and meaningful pleasure—a way into understanding how and why these recurrent patterns come into being, which takes me very deep into the fundamental questions that contemplative human beings have always pondered. My love of natural patterns led me to uncover the role of what I nowadays call 'natural inclusion' as the universal underlying relationship from which all patterns of life—and not just 'biological life'—ultimately arise. In the process of this 'uncovering', I had to work my way down imaginatively through many veils of superficial 'appearance' to arrive at the simple relationship between movement and stillness from which those appearances emerge. Here, I invite you to accompany me down through those layers, and wonder if we will find ourselves arriving in the same place.

So let me now take you on a 'nature walk' with me. As we explore receptively, with eyes and minds wide open, let me ask *you*, as an appetizer, what recurrent themes *you* notice as you explore the natural world. Do you see stars and stripes, circles, lines, spirals, ripples, rivers and crazy paving? If so, where? Do you see any other kinds of recurrent pattern that I have not mentioned?

Imagine yourself included in this scene (Fig. 2.1).

Has this scene always been as you see it here, and will it always remain as you see it now? If not, how has it come into being, and how will it change? What makes the forms you see distinct from one another and their surroundings? Why is it that you do not just see a featureless monotone, but instead apprehend a marvellous array of shapes, shades and colours? Why, with yourself included amongst what you see, are these visual distinctions added to by a rich variety of sounds, smells, temperatures and soft and hard textures, including those within your own body—all of which combine into your sensation of being miraculously present as an *inhabitant* of the scene, throbbing with life?



**Fig. 2.1** Members of Bath Natural History Society taking lunch during a meeting at Newark Park, Gloucestershire (photograph by Marion Rayner)

Now, while still imaginatively including yourself and your feelings as an observer within the scene you are observing, not standing aloof from it, let us pay a visit to one of the inhabitants of the scene, for example a tree. From a distance we might just make out the appearance of something like a fuzzy lollipop, sticking out of the ground. As we move in closer, more and more of its branching structure becomes discernible, shooting out from its trunk into smaller and smaller offshoots, culminating in buds, leaves and flowers. As we move beneath its canopy, we become aware of the shade it casts over us and the diversity of life forms that reside beneath its cover. We notice the airiness that is all around and amongst its branches and foliage, sometimes quite still, other times whispering gently or even rushing stormily. If we look closely enough, with the aid of a magnifying lens, we can witness where this airiness enters the tree's leaves and corky covering, through pores known technically as stomata and lenticels.

Meanwhile, we can sense the varying smoothness and roughness of the tree's bark. We might hear the calls and fluttering movements of birds, and catch sight of their diversely coloured and patterned plumage in flight or perching. A squirrel may distract us. Examining some tree leaves closely, we might encounter some insect or arachnid life finding a home or source of food amidst the ribs and networks of veins (Figs. 2.2 and 2.3).



**Fig. 2.2** Close-up view of the spider, *Paidiscura pallens*, and its spiky egg-case, on the underside of an oak leaf (photograph By Rob Randall)



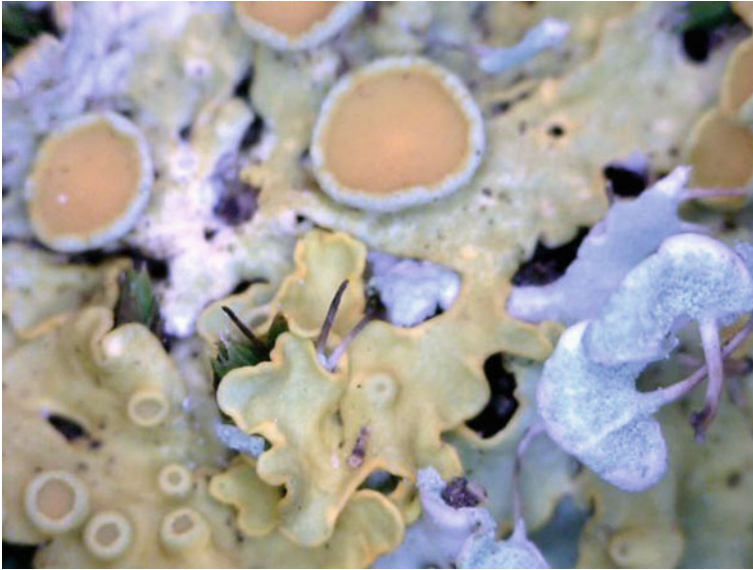
**Fig. 2.3** Larva of green silver-lines moth, *Pseudoips prasinana*, with patterning of lines and spots, on underside of a hazel leaf (photograph by Suk Trippier)

Surveying the tree's trunk, branches and the ground into which its roots spread, we might notice the wonderful rippling, branching, sprouting, erupting, collapsing variety of lichens, mosses, liverworts and vascular plants that find a home here (Figs. 2.4, 2.5, 2.6, 2.7 and 2.8).

So, too might we notice the fanning, mushrooming and splurging fruit bodies of fungi that find food and shelter deep within the tree's woody interior and decomposing remains, as well as those forming what are known as mycorrhizal partnerships with the tree's roots. If we were to dive down microscopically with the tubular hyphae of those fungi into the wood of the tree, we would discover it to be full of holes—the communicating pipelines that link water-absorbing roots with photosynthesizing canopy—not the solid block of substance, it might seem to be at first (Fig. 2.9).

Now, coming out from the shade of the tree into the bright light of day, our attention might switch to wider vistas, to notice the form of the landscape with its hills and valleys rising skywards and descending towards sea level. We might notice the branching, sinuous watercourses that run through the valleys, simultaneously shaping and being shaped by their banks in a mutual correspondence of each with the other. We might notice flocks or herds of grazing animals either scattered around the hillside or following one another's footsteps from one pasture to another, along worn-down paths that resemble the convergences and divergences of the watercourses. Lifting our eyes skywards, we notice birds in flight, either as singletons or in pairs or groups with few to thousands of members. Amongst the latter may be what are known as 'murmurations' of starlings, co-creating smoke-like patterns as they twist and turn together in dynamic relationship with those air currents that carry shape-shifting clouds along with them. Where the sky is clear we may catch painful sight of the sun's orb, or notice the pallid disc of a daytime moon.

Notice how our attention has shifted with this move out into the open, from close-up and intimate to far away. While exploring under the tree's canopy we felt enveloped within and by the life abounding there. Outside it, standing upright and gazing from a fixed *viewpoint*, the vision provided by the binocular eyesight characteristic of primate mammals (i.e. with eyes on the front of our faces) stretches in classical perspective towards the horizon where all that seems large in foreground shrinks to *vanishing point*. We feel a static sense of remoteness from what we are observing horizontally. We experience a sense of elevation over the *substance* beneath our feet, as if the self within our bodies is outside or above it all. It is a powerful illusion that can very easily go to our heads, alienating us from our surroundings. This is the illusion that makes us perceive and analyse the natural world about us in an abstract, photographic way. It is as though a shift takes place in our perception of space as a receptive presence everywhere in which we feel ourselves immersed like fish in an ocean, to a purely external background void from which we feel isolated. McLuhan (1967) alluded to this as a shift from 'acoustic space' to 'visual space', and it is at the root of abstract, objectivistic scientific thought and method. We place the world within a fixed frame of space and time that does not include us, and incorporate this distanced perception into our definitive



**Fig. 2.4** Close-up view of the lichens, *Xanthoria parietina* and *Physcia adscendens* on a tree branch



**Fig. 2.5** Close-up view of Bruch's Pincushion moss, *Ulota bruchii*, growing on a tree branch (photograph by Paul Wilkins)



**Fig. 2.6** Rippled fronds of Hart's-tongue fern, *Phyllitis scolopendrium*, with stripe-like spore-producing sori on their undersides, growing on shady bank amongst trailing ivy stems and foliage (photograph by Marion Rayner)

**Fig. 2.7** Unfurling spiral of a fern frond (photograph by Marion Rayner)





**Fig. 2.8** Shoots and starry flowers of Wild Strawberry, *Fragaria vesca* (photograph by Marion Rayner)



**Fig. 2.9** Fruit bodies of Turkeytail fungus, *Trametes versicolor*, with multi-coloured, concentric, glossy and furry banding, growing out between the cracked bark of a decaying tree branch (photograph by Marion Rayner)

logic, language and belief systems. We may even come to regard and analyse ourselves in the same way, as remote objects that we imaginatively stand outside and scrutinize.

All it takes to overcome this *objective* distancing is to ‘come back down to Earth’, bringing what we are observing back into the intimate, sensuous range within which we feel the enormity within ourselves immersed. We might get down onto our hands and knees and scrutinize the miniscule life forms living amongst the grass and soil. Or we might spin our bodies around, to take in the panoramic, self-including view that comes naturally to grazing animals, with eyes on the sides of their heads instead of the front of their faces.

***The Humility of the Valley***

*Life doesn't strive*

*To secure its foundation*

*Upon the rocky serrations of the High-minded*

*Where Men build castles in the air*

*To furnish that false sense of superiority*

*Which comes from the pretence*

*Of overlooking all around*

*To the edge of infinity*

.

*Life thrives*

*In the seclusion of the valleys*

*Where dampness accumulates*

*In the earthy humidity*

*Of humility*

*Warmly tucked in*

*To the bed of sea and land*

*Rich with variety*

*Exuding*

*Intruding*

*Out and into the cosiness*

*Of each lovingly enveloped*

*In the other's influence*

.

*Wisdom cannot be found*

*On peaks of adaptive fitness*

*Running with Red Queens*

*But only in that radiant depth*

*That reaches everywhere*

*Through the heart of somewhere*

(Rayner 2011b).

There is also another way in which our perceptions of the world about us can change radically, and that is to experience it at night—an experience that the bright lights of the city have rendered strangely unfamiliar for a great many modern-day human beings. And it is an experience that time immemorial has brought a powerful combination of fear and awe to human beings. The fear is due to the uncertainty that comes when we lose our ability to see where we are. Without this ability, we cannot detect potential dangers or find what we are looking for. We feel vulnerable. We crave the certainty that our eyesight affords, and so yearn for light to banish darkness. Such is the reliance of sighted people on our visual sense that we may even come to associate darkness with ‘evil’ and death. But in trying to gain certainty by excluding ourselves from darkness’s reach, not only can we also lose our sense of awe but we can also reinforce the visual illusion that distances us from our natural neighbourhood, and even from ourselves.

Let us now imagine ourselves on that hillside in Fig. 2.1, as sun sets and dusk sets in. The first thing we may notice as the clarity of our vision begins to fade is an increased sensitivity in our hearing, which picks out bird and animal calls. It also picks out the silence within and between and within those punctuations, which turns them into music. Landscape becomes soundscape. Nocturnal animals, whose active time of day is night, start to make their presence known. We may catch a glimpse of the flickering wing beats of bats and moths, the ghostly, silent fluttering of a barn owl or hear the hoots of a tawny owl. Slowly darkness enshrouds us and we begin to rely on heightened tactile senses to grope and feel our way around. The darkness itself is not painful, though the bites of midges homing in on our warm bodies may be. Then as our night vision begins to adjust, and providing there is a lack of cloud cover, we notice the stars coming out and the pallid disc of the daytime moon transforming into shimmering brilliance. The darkness does not prevent the light from these heavenly bodies from reaching us, but instead offers it free passage. For, this kind of darkness is simply the transparency of space, and not light-absorbent fabric. The frictionless, transparent, silent darkness of space is not an enemy of light. It is a natural presence that permeates everywhere, without restriction but only becomes noticeable when our visual senses are not flooded with illumination—as also occurs during total solar eclipses. Nor is this darkness ‘cold’—in reality it is a thermal insulator, as we make use of in vacuum flasks that keep their contents cold or hot. This darkness is not in itself anything to be fearful of—it is only what our imaginations make of it that can be truly terrifying.

*You, Darkness*

*You, darkness, that I come from*

*I love you more than all the fires  
that fence in the world,  
for the fire makes a circle of light for everyone  
and then no one outside learns of you.  
But the darkness pulls in everything-  
shapes and fires, animals and myself,  
how easily it gathers them! -  
powers and people-  
and it is possible a great presence is moving near me.  
I have faith in nights.*  
Rainer Maria Rilke.

The darkness of space is not, however, the only natural presence that can escape our notice or terrify us as we terrestrial primates go about our daily affairs. And while, as subsequent chapters will show, the darkness of space is the birthing place for matter itself, this other natural presence is the birthing place for organic (carbon-based) life itself, as we know it here on planet Earth. It is the presence that accounts on average for around 65% of the weight of a human body and 99% of its molecules. We nonetheless fear it, especially when it is gathered in large quantities, as a source of great uncertainty and hidden depth within which we, as air-breathing creatures trying to stay afloat can all-too-easily become exhausted, lose body heat and drown. It is, of course, water.

*I must go down to the seas again, to the lonely sea and the sky...  
For the call of the running tide,  
Is a wild call and a clear call that may not be denied...*  
John Masefield.

If we were to dive down beneath the surface of John Masefield's land-dwellers' impression of the open sea, we would find a place that is often anything but lonely. Alternatively, as the running tide draws its liquidity back from high to low, an astonishing scene is revealed to those of us prepared to open our senses to what lives there. So let us now extend our walk down to that dynamic interfacing where sea meets land in mutual encroachment. Here is a painting, entitled 'Intertidal Highlands' that I made some years ago, based on observations made on the rocky seashores of Gower peninsula in South Wales (Fig. 2.10).

Here, laid out before us in myriad guises are examples of every kind of life pattern that I will consider on this book. Organic life on Earth is widely thought first to have evolved in the sea, and it is here that the capacity for living pattern generation in all its fluid-dynamic possibility first flourished. Emergence of life from this aqueous nursery onto land entailed exposure to high light intensity, wind, desiccation, rapid diffusion of gases such as oxygen and carbon dioxide, while



**Fig. 2.10** 'Intertidal highlands' (oil painting on board by Alan Rayner 1998)

leaving behind the buoyant support and powerful currents of water as an external as well as internal milieu. The effects of these environmental changes on bodily form are evident in the distinctive zonation patterns found below, above and between low and high tide marks. I often reflect that our view of life and neighbourhood would be very different—and less prone to objective abstraction—if we were truly marine creatures rather than terrestrial apes predisposed to single out and grasp what we need to feed, clothe and shelter ourselves. Here is a painting and a poem based on that reflection, called 'Landed Stranded' (Fig. 2.11).

***Landed, Stranded***

*A reflection upon the evolutionary inversion from aquatic to terrestrial life*

*I used to be*

*Within the Sea*

*An identity*

*Of You and Me*

*Submerged*

*In Commonality*

*Of Sounding*

*Between Airy Heights*



**Fig. 2.11** 'Landed stranded' (oil painting on canvas by Alan Rayner 2004)

*And Bottom Depths*

*Waving Correspondence*

*Through Inseparable Togetherness*

*Of Content with Context*

.

*But, Now,*

*Dry*

*Abstracted*

*Space comes between Us*

*A separating distance*

*An unbecoming Outside*

*Alienating Forms*

*As Fixtures*

*Stranded in Isolation*

*Entities*

*Non-identities*

*Conflicting*

*Oblivious of Our Belonging*

*Together*

.

*Oxygen*

*Now, moving Fast*

*Not Languidly*

*Tans our Hides*

*Protecting Our Inner Space*

*Against its own*

*Consuming Presence*

*Supporting Combustion*

*Burning Us Out*

.

*But all this sealing*

*Removes Our Feeling*

*Setting Our Content*

*At Odds with Our Context*

*So that we push*

*Against the Pull*

*With Backs to Front*

*Itching to Relieve*

*Unbearable Friction*

.

*And So Now*

*Just Let's Go*

*And, with Loving Fear*

*Dive into the Clear*

*And Swim Where it's Cool*

*To be In With the Pool*

*Together.*

**Fig. 2.12** ‘Recalcitrance’ (oil painting on canvas by Alan Rayner 2001)



So far, the examples I have chosen have all been what are known as ‘macroscopic’ forms of biological life, because we can readily observe them with the naked eye or a low-power magnifying lens. The recognition that these forms are actually composed of what are typically microscopic structures called ‘cells’, was undoubtedly one of the most significant discoveries of modern science. It set the scene for all we now know about genetic inheritance and how the biochemistry of life is organized within fluid systems of membranes and organelles. My painting above represents how the outward life of a ‘Star Thistle’ plant (*Centaurea calcitrapa*) arises from the inner life of a vulnerable body of cells living and functioning collectively (Fig. 2.12).

It is perhaps unfortunate, however, that on account of their immediate appearance when examined under a microscope, cells were ever actually called ‘cells’. To do so reinforces the misleading impression of them and their molecular components as the rigidly self-contained units and sub-units that abstract science and mathematics has been all-too-ready to depict popularly as ‘building blocks of life’. In reality, cells are not assembled from building blocks, nor are they assembled into multicellular bodies by some mysterious building agency. They are, like all the forms of life that they arise from and give rise to, fluid-dynamic localities bounded by a membrane that sustains an electrical potential difference between its inner and

outer surfaces. This potential difference arises from the use of chemical energy ultimately derived from sunlight or geothermal or chemical sources. In other words, cells and their contents are dynamic natural inclusions of their neighbourhood, not independent objects. No sooner is their potential difference discharged, for example by the ice-damage portrayed in my painting, then they die and the energy they contain is released for take up elsewhere. When present together in multicellular bodies, which arise from the proliferation of parental cells (as when an egg cell divides following fertilization to form an embryo), they depend on communication with one another through their enveloping membranes and (where present) ‘cell walls’ in order to function coherently.

Are you seeing what I am seeing? Those same recurrent patterns, wherever you care to look for them, at whatever scale from tiny to enormous, both within and far beyond the bodies of Earth’s living systems: stars and stripes, circles, lines, spirals, ripples, rivers and crazy paving—plus a myriad variations and combinations of these basic themes.

Would not it be good to be able to understand how and why these patterns arise? I have certainly always wanted to be able to do so. Being an enthusiastic natural scientist, it was to conventional evolutionary theory and mathematics that I first looked for an answer. But after much researching and soul-searching, I realized I would *never* find an adequate explanation this way, because the underlying objectivistic framing of those approaches actually depends on excluding from consideration those very presences throughout Nature that are so vital to the very possibility for patterns to form.

Instead I literally drew insight from my own efforts to illustrate diverse patterns of life in paintings, such as this one, ‘Future Present’, in which I sought to feature every major group of life forms currently resident on planet Earth and their watery origin as expressions of genetic code (Fig. 2.13).

If you want to get a *feeling* for what you can observe in the natural world, I think there is no better way than actually going through the physical process of trying to draw, paint or sculpt it with hand, eye and brain working together. Instantaneously capturing it in a photograph, or letting a digital computer program figure it out for you will not work, and—for reasons I will describe shortly—can even be profoundly misleading. Try it for yourself. *Honestly* try to draw or paint a flower *as it actually is*, for example.

It was quite obvious to me that I could only bring my painting of ‘Future Present’ into existence by combining stiff paint pigment with loosening solvent on a receptive surface and moving it around. Paint pigment alone would remain just a blob. I needed to add solvent and then *work* it into the variety of shapes, shades and colours of the painting.

What does this imply about the fundamental creative process through which any form or pattern comes into being? The simple answer I explore in this book is this

*Natural creativity is due to the inclusive relationship between emptiness, movement and bodily resistance to movement, i.e. space, energy and material inertia.*



**Fig. 2.13** 'Future present' (oil painting on canvas by Alan Rayner 2000)

For any form to come into being, there have to be at least two basic kinds of presence in Nature: a motionless, *receptive* presence (i.e. a form-receiving presence, analogous to empty canvas) and an *intrinsically* mobile, *informative* presence (i.e. a form-giving presence, analogous to fluid paint). Moreover, these two kinds of presence must *include each other*: the receptive presence alone would be vacant—*analogous to empty canvas*—and the informative presence alone would have nowhere in which to move around and so give rise to forms of diverse shapes and sizes. In the most fundamental and universal sense, applicable literally to *everywhere*, these two natural presences are experienced in the feeling of emptiness that we call 'space' (what McLuhan called 'acoustic space', see above) and enlivening flux that we call 'energy'. Energy paints the variety of the natural world on an intangible canvas of receptive space.

Quite simply

- Receptive space is a naturally occurring emptiness everywhere that is not a substance but *invites energy to inhabit it with substance*. It is motionless, frictionless and hence provides freedom for movement. Whether viewing from outside-in or inside-out the distinguishing boundary of any natural form, it is impossible to reach a *limit* where space ceases to exist. Hence it is a truly *infinite* presence
- Energy is continuous, natural motion. It comes packaged into local substance as ‘matter’, and disperses as ‘radiation’

I will elaborate on this central theme of *natural inclusion as the mutual inclusion of receptive space and informative flux in all distinguishable natural occurrences* throughout this book. Energy and space combine into local material bodies as *flow forms*, which, while being made from movement, resist being moved or deformed out of place to varying degrees depending on their composition and circumstances. These flow forms can be thought of as ‘energised beings’, whose association, dissociation and exchanges of energy with and from one another is the source of evolutionary variety across all scales of natural organization, including biological organization.

I recognize that this is a very unfamiliar way of understanding the relationship between natural space, energy and matter. To my knowledge it has not been published *explicitly* by any previous author, because of the way these presences have been construed by abstract thought as derivative quantities of ‘separation’, ‘force’ and ‘mass’. But when we think about it this way, every natural bodily form is actually 100% space plus energy, not part space and part mass. Energy is what brings life to space and space is what enables energy to be expressed in a vast variety of flow forms that are neither completely definable as ‘particles’ nor uniformly spread out as ‘fields’.

That is why conventional analytical science could not help me to understand pattern formation and recurrence—because it is based on *excluding* space, as void background, from energy and is hence incapable of comprehending their mutual, *co-creative* relationship in material bodies. In effect, it *isolates* ‘paint’ from ‘canvas’ and so arrests energy within a mathematical point of material with no size or shape, while rendering space into a passive absence of presence, without receptive influence.

As I will expand upon in Chap. 3, conventional science and mathematics seek objectively to *capture* the infinite receptive expanse of space within a three-dimensional frame, and to construct all forms from dimensionless points into breadth-less lines, depthless planes and solid figures. *It does not work*. Both the receptivity of space as a frictionless presence and the intrinsic mobility of energy as an informative presence are omitted from consideration, leaving us with a paradoxical set of solid building blocks from which nothing in reality can be brought into existence! How many schoolchildren, I wonder, have been puzzled by this practice? Even Einstein abstracted matter/energy from space/time, a mental severance that has continued to undermine his and others’ efforts to reconcile relativity theory with quantum mechanics.

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