CHAPTER ONE

# The Rhythm of Learning

I begin with an account of Whitehead's three stages of education. My approach is not to provide a close reading of first one and then the other of the two relevant essays, first "The Rhythm of Education" and then "The Rhythmic Claims of Freedom and Discipline." Rather, I draw freely from them both in offering an interpretation of each stage sequentially: first Romance, next Precision, and finally Generalization.

## Brave New Worlds

Whitehead argues that the first stage of learning should be that of Romance, in which students are encouraged to explore in as wide ranging and adventurous a way as possible the natural and cultural worlds in which they live. The mood is appreciative and inclusive.

The stage of romance is one of "first apprehension" ("Rhythm" 17), says Whitehead. It is marked by our initial "awakening to the apprehension of objects" (19), to an awareness of the objects of immediate experience comprising the content of our world. As newborns, this world is narrow, composed of our aching hunger, an offered nipple, and softly cradling warmth. That inchoate world slowly expands as we grow, coming to include the noise of our own crying, flashes of movement, cold touches and smooth textures, smiles and hugs. Eventually it encompasses the sticks and stones, chairs and tables, cats and dogs, fathers and mothers of the everyday commonsense world. Romance is an occasion for delighting in this world immediately around us, savoring its flavors, basking in its sunlit embrace.

Openness to the world as we find it is only a partial characterization of what apprehension involves, however. For Whitehead's world is pro-

foundly holistic, its individual objects internally related to each other. So romance is more than an awakening to things; it is also an awakening to an "appreciation of their connexions" (19). There is more to the familiar than meets the eye. The objects of our experience, we come to realize, have an "import": they come redolent with "unexplored relationships" (18). What we apprehend "holds within itself unexplored connexions with possibilities half-disclosed by glimpses and half-concealed by the wealth of material" (17). For everything we encounter, there is a "more" it conceals, a terra incognita still to be disclosed, a world vivid with novelties, a world of such unbounded plenitude that nothing can be noticed without whatever is next to it catching our attention and evoking our response.

Hence "interest is the *sine qua non* for attention and apprehension" ("Rhythmic Claims" 31), and so education at all levels should constantly root and reroot itself in the same fertile soil—the inherently interesting, wonderfully alluring thises and thats of the world around us.

As an infant, I turn my head toward jingling noises and circling movements, cooing at their presence and crying when they stop. I reach out for an object myopically glimpsed and bring it to my mouth, taste what it's like, and from the resulting sensation discover that it can be delightfully sweet or unexpectedly bitter, deliciously slippery or repulsively rough. At first, I don't generalize: I experience this-here-now sweetness and then this-here-now bitterness. I suck the world in or spew it out, and remain as curious as ever about how it might taste when next I get it to my mouth. As I become a toddler and sense the permanence of objects, I look for the bird to whose morning song I have awakened, wondering when the sound stops where it has gone and why it is hiding from me. Perhaps if I fall back to sleep, when I reawaken it will have returned. Or perhaps it only sings when I have arranged my stuffed animals in a circle properly attentive to the magic of its melody.

While playing alone in my backyard, an unturned stone becomes a mystery I must set about solving. Its smoothly rounded visible surface promises a smooth completion on the unseen portion of its circumference. But this promise comes with a titillating hint that the underside might have a different shape altogether and might even afford access to creepy-crawly worms or pale curled tubes of plants it has been holding prisoner. At least that's what a stone's underside disgorged the last time I turned one over, even though, come to think of it, that wasn't so for the stone before that one. And thereby is kindled the mystery of the stone I now approach with delightfully anticipated disgust.

My father gives me a big white-and-black ball with which to play. I sit down and a playmate sits facing me, each with our legs spread apart, so that we can roll the ball back and forth, trying to guide it between the other's legs. Soon we get good enough for our little game to grow tiresome, and so I purposefully miss, requiring my friend to get up and retrieve the ball in order to take her proper turn. Then she tries to miss as well, and we end up kicking the ball, racing after it, kicking it again, racing and kicking until we fall exhausted and laughing on the grass. In kindergarten, my teacher takes us for a stroll in the nearby park where we run after a bird we see hopping across the grass. We then climb in the rocks, throw pebbles into the stream, and play catch-me among the trees. I go running to our teacher in momentary fright when an unfriendly bird scolds me raucously from somewhere above us, and I am glad to walk back to the familiar safety of our school hand-in-hand with my classmates.

I am given a new book to read in first grade, each page of which is fraught with the unknown pages still to come. I am tempted to peek ahead, to learn where I am about to go before going there. And when I succumb to this temptation, I thereafter enjoy the smug godlike satisfaction of knowing what the characters in the story cannot yet know because for them it has not happened. Ahead of spoken words I cannot peek, however. Which is the drawback of having my teacher or aunt or older brother read to me, or of listening to the story on an audio disk. Some of my classmates prefer hearing a story, comfortably surrounded by friends, the characters in the story incarnated by a reader's familiar voice. I prefer, however, the solitary silence of reading a book to myself, with no constraints on where my imagination can take me, even when it takes me so far and fast that I become lost in my fantasizing and the book falls unnoticed to my lap.

On a summer vacation to the beach after second grade, I build a castle in the sand, struggling unsuccessfully in the growing dusk to buttress it against the rising tide by surrounding it with a moat. To ease my unease, I imagine myself somehow transported to a castle in the sky where no tide ever threatens and the sun always shines benignly on my projects. I sign up with a third-grade Y-Club soccer team and learn that a black-and-white ball can be used to play a game which involves me being on a team, wearing a blue T-shirt, and trying to kick the ball down the field into a net while other kids in yellow T-shirts are trying to kick the same ball into a net at the other end of the field. This is good fun, although sometimes I forget about the net part and am content just to kick the ball

before a yellow shirt can, no matter where I kick it. This can often be difficult, what with all twenty or so of us gathered around the ball at once.

By sixth grade, I am reading adventure stories and imagining myself as a participant in them. I am Arthur as he grasps the sword in the stone and as the ladies bear his wounded body across the lake to Avalon. I am Guinevere as she wrestles with her impossible love for both Arthur and Lancelot, and as she withdraws at the end into a monastery castle surrounded by a moat. I come up with a new idea, an idea of my own invention, about how the Round Table should be formed and how the Quest for the Holy Grail should be pursued, and lying in bed at night I spin out its exhilarating implications.

In all the phases of our lives—as babies, toddlers, kindergartners, and grade-school pupils, but also as adolescents and adults for whom childhood is never merely a memory—the stage of romance is a time when "ideas, facts, relationships, stories, histories, possibilities, artistry in words, in sounds, in forms and in colour, crowd into the child's life, stir his feelings, excite his appreciation, and incite his impulses to kindred activities" ("Rhythm" 21). In romantic experiences, the world "stirs" our imagination, "excites" our curiosity, and "incites" us to respond in kind, to make ourselves "kindred" spirits with it, and through it with each other. We learn to delight in the multifarious gifts of the world, delighting in them for their own sake and responding to those gifts in all the ways they invite response.

Whitehead offers an example of how this adaptive exuberance works in his account of reading DeFoe's *Robinson Crusoe* for the first time. Crusoe is just a character in a story, an imaginary man stranded on an imaginary island. I come to the story with a repertoire of everyday knowledge. I know about men and women, my parents and adult friends. I know about their busy comings and goings in the cities and towns where I live. I know about my own experiences in the home, at school, around the neighborhood. And I know about islands, about their beaches, and about how walking on them leaves footprints in the sand. "But the sudden perception of the half-disclosed and half-hidden possibilities relating Crusoe and the sand and the footprint and the lonely island secluded from Europe constitutes romance" (18). Aspects of my everyday world, taken for granted because they are so everyday, so boringly commonplace, are brought together by the story in such a manner that something more than their everyday meaning rises to the foreground, shimmering with import, with unexplored implications that whet my imagination.

I wonder about what it might be like to live so far from civilization, to be forced to seek food and shelter on my own, to have the courage and craft it would take to survive. I worry about what the dangers might be, what carnivores might be lurking on such an island, wanting me for their evening meal. And then, amid these unsettling questions—behold, that footprint in the sand. A simple fact, unexpectedly adding mystery to danger, the uncanny to the unknown. There are no fortresses ready at hand to offer me protection, no obvious path along which I might escape. Even Excalibur would not be enough, nor Lancelot riding to my rescue. And yet if I were Crusoe I could surely manage. And, ah yes, look: it seems he manages quite well indeed. He has the right stuff, that guy, and so would I.

The "natural mode" for stirring our imagination, for exciting our interest, for inciting us to explore the undiscovered import of our immediate experiences, is "enjoyment" ("Rhythmic Claims" 31). Whitehead doubts the efficacy of birch rods. They work, to be sure, but only as long as an authority figure is wielding them. "Undoubtedly pain is one subordinate means of arousing an organism to action. But it only supervenes on the failure of pleasure." A person's education is best furthered "along a path of natural activity, in itself pleasurable" (31).

In another of Whitehead's striking examples: a teacher assigns me the task of looking at the stars through a telescope, but unless my experience is marked by the "transfiguration of imposed routine" that romance cultivates, unless for me this is not an assignment to be carried out but rather an opportunity to gain "free access to the glory of the heavens" (33), no genuine educational growth will occur. "Without the adventure of romance, at the best you get inert knowledge without initiative, and at the worse you get contempt of ideas—without knowledge" (33).

I am more likely to eat my brussels sprouts because I enjoy eating a good meal—in the company of friends, or attended by my favorite stuffed animals, or hand-in-hand with some young prince whose destiny may be entwined with my own—than because I have been told that without eating dark leafy vegetables I will die of a heart attack in my forties or because I am dutiful to my parents' insistence that I eat everything on my plate. Babies will spit out the spoon of spinach mush, and who can blame them, unless we transform the spoon into a speedboat and their mouth becomes its safe harbor.

Every soccer player wants to be a striker, for it is from that position that a person is best able to score goals, and surely no one would

voluntarily pass up the glory and satisfaction this entails. Yet a team has eleven positions, many of which involve a basically defensive role, so one of the tasks elementary school coaches have is assigning most of their players to unglamorous positions. A poor coach might tell me in a take-it-or-leave-it authoritarian voice: You play sweeper or you don't play. Good soccer coaches, however, will lure me into discovering the excitement and satisfaction of playing defense, discovering skills I didn't realize I had, and coming to appreciate how the strikers are dependent on us defenders for their success. It's our ability in preventing an opponent from scoring goals that turns a striker into a hero for putting the game's only goal into the net. How exhilarating it is to discover the joys of being a team player, to sense the deepening character that comes from recognizing my intrinsic even if unsung worth.

We are more likely to read a philosophy book, maybe even Whitehead's horridly difficult *Process and Reality*, if some of his epigrams from *The Aims of Education* have pricked our imagination and set us wondering about what vision of the nature of things might lie behind his clever turns of phrase. Whitehead says, for example, that "The present contains all that there is. It is holy ground; for it is the past, and it is the future" ("Aims" 3). Our rational imagination is likely to be titillated by this assertion, for how could we not wonder what he could possibly mean, this philosopher who is said to take time seriously, when he not only sanctifies the present moment but claims that's all there is. We might be drawn by this curious claim of his to struggle willingly with such obscurities as his assertion "that the potentiality for being an element in a real concrescence of many entities into one actuality is the one general metaphysical character attaching to all entities, actual and non-actual; and that every item in its universe is involved in every concrescence" (*Process* 22). Better the lure of the quote from *The Aims of Education* than the threat of a poor grade on the next hourly exam, if the aim of education is to nurture a love rather than a contempt for ideas, to bring ideas alive rather than, finding them inert, to bury them as soon as the hour exam is over and they have begun to putrefy.

Whitehead calls the path of natural learning "discursive" because it is "a process of discovery, a process of becoming used to curious thoughts, of shaping questions, of seeking for answers, of devising new experiences, of noticing what happens as the result of new ventures" ("Rhythmic Claims" 32). Romance, in other words, has a trajectory. It involves not only apprehension, appreciation, and interest but also their iteration until

they become habits of the heart and mind. In the stage of romance, we are not only learning about whatever our inquiries happen to turn up but also developing a habit. We are becoming used to asking questions and seeking new experiences, imagining novel possibilities and ferreting out their implications. Romance begins in wonder and develops a wondering disposition. Under its aegis students develop a discursive openness to things, a predisposition to follow the story wherever it might lead and to revel in the amazing adventures that thereby ensue.

A predisposition is a habit, and thus in classrooms at every level the most important task of a teacher is helping students develop a habit of being curious. The wise pedagogue teaches romance best by not getting in the way of a student's natural curiosity, but that curiosity needs to be pricked until its exercise becomes a habit. Laissez-faire is not enough. "Now undoubtedly," says Whitehead, "this stage of development requires help, and even discipline" (32). A teacher should therefore intervene, although light-handedly, creating an appropriately stimulating environment, one "chosen to suit the child's stage of growth" and "adapted to individual needs" (32), setting tasks and challenges, encouraging and suggesting, admonishing and redirecting. These interventions have to be done in such a way that students respond out of their own kindled interests and not because they feel compelled to do so, eventually responding because of their inquisitive proclivity, their habitual curiosity, their cultivated wonderment. Any such intervention is "in a sense" an "imposition from without; but in a deeper sense it answers to the call of life within the child" (32–33).

Some events thrust us willy-nilly into their enthralling mystery, force us to question their significance, even to wonder about their intelligibility. But romantic education should teach us to ask questions of even what is apparently obvious or trivial, to be curious about what is deemed irrelevant or threadbare. We should be interested not only in exploring the unexplored dimensions of our known world but also in poking around for other unnoticed or hitherto unknown dimensions, and wondering about what lies beyond even all of that. The romance stage of education has done its work when "there has been plenty of independent browsing amid first-hand experiences, involving adventures of thought and of action" (33).

The habit of looking under rocks, imagining how sand castles might survive the tide, conjuring imaginary friends to help eat our brussels sprouts—they are all ways in which we do not take the way things are as

necessities to which we must bow down. We cannot change what is the case, but we can imagine it as only a part of something grander, a portal into a fairyland or an alternative universe or a better tomorrow. We can develop a habit of presuming that there is more here than it would seem, and that it is a wondrous more, alien and threatening perhaps, but fraught enough with bright possibilities that uncovering it seems well worth the risk. We will never discover the golden fleece hidden in a land just beyond the farthest edge of the known sea, unless the prospect of encountering dragons along the way lures us into setting sail from the comforts of our familiar hearth, thrilled more by the adventuring than by the goal, excited more by the likelihood of storms and pirates than by the placid harbor to which we might eventually come.

The attraction of stories is that they take us through such mysterious portals and across such ranging seas while we are curled in a chair by the fire. And yet these imaginative tales are every bit as dangerous as actual journeys because they also take us beyond the boundaries of our accustomed imaginings into what had been for us not only unknown, not only unbelievable, but hitherto simply unimaginable. "O wonder!" gushes Miranda, seeing for the first time human beings other than her father and Caliban,

> How many goodly creatures are there here!
> How beauteous mankind is! O brave new world
> That has such people in't. (Shakespeare, *Tempest* Act 5, Scene 1)

It's quite a sorry group of men at which she looks, that shipwrecked duke and his entourage, but she finds them "brave"—handsome, noble, wondrous—because her knowledge of humans is so limited, the boundary of her world so narrow. Calm down, says Prospero, you overstate things; they are really not so brave, it's just that "'Tis new to thee."

We are intrigued by the possibility of new beings of which we are as ignorant as Miranda was of us and our kind—Chewbacca, R2-D2, and Yoda; Frodo, Gimli, and Elrond. And yet in seeking them out as our friends and allies, we run the risk of meeting instead Emperor Palpatine or Darth Vader, Gollum or Sauron. Even Miranda's brave new world of handsome men might be transformed for us, as for Aldous Huxley, into a dystopian nightmare. Romancing our world opens it out, pushes back its boundaries, and does so in often surprising ways, disturbing our

familiar comforts, bringing us into the presence of more things than we imagined possible—things that sometimes are for the better, sometimes for the worse, but that are always transformative.

## Masterpieces

Whitehead says that the stage of romance in our educational development should in due time pass over into a stage of precision, a stage in which "width of relationship is subordinated to exactness of formulation" ("Rhythm" 18). We have a natural "aptitude for exact knowledge" (22), says Whitehead, for a shift in our way of learning from one rooted in appreciation to one that is critical and analytic. Without the prior interest stirred up by romance, however, the exact knowledge we achieve will be merely "a series of meaningless statements about bare facts, produced artificially and without any further relevance" (18). Yet although the romance is crucial, it is important that it give way to precision. The right time for this shift is when the freshness of romance has begun to wane, when our initial curiosity has been satisfied and we grow restless with the limitations inherent in appreciative apprehension, thinking of it increasingly as superficial. When we come to it in this timely fashion, "precision will always illustrate subject-matter already apprehended and crying out for drastic treatment" (25).

Descartes is the patron saint of precision because in his *Discourse on Method* he provides a set of instructions for arriving at the exact truth. He is upset by the conflicting claims made by scientists and philosophers, by kings and priests, that they alone know what is true. Refusing to accept any of these warring claims simply on the authority of their advocates, he decides to find out for himself how to distinguish genuine truths from supposed truths. He resolves to be "like a man who walks alone in the darkness": he will proceed in step by step fashion, "slowly and circumspectly," sacrificing rapid movement in order to be "at least safe from falling," until he arrives at conclusions he can trust to be true (*Discourse* 11).

Descartes proposes a method that involves four simple steps. First, "never to accept anything as true unless I recognize it to be evidently such," which means that it presents itself "so clearly and distinctly to my mind" that there can be "no occasion to doubt it" (12). Second, "divide each of the difficulties which I encountered into as many parts as possible,"

each one of which because less complex than the initial difficulty will make for "an easier solution" (12). Third, "think in an orderly fashion," moving from the "simplest and easiest to understand" to what is "more complex" (12). Fourth, "make enumerations so complete, and reviews so general, that I would be certain that nothing was omitted" (12). Identify, analyze, synthesize, and then check your work.

Attaining the exactness to be cultivated during the stage of precision involves, first of all, grasping particular facts clearly and distinctly, specifying precisely what each one is and is not by analyzing it into its simplest components. Such precision is best achieved by quantitative measurements, so the educational examples that come immediately to mind are scientific ones—determining rates of motion in a physics class or identifying precipitates in a chemistry lab. Sometimes, however, the only kind of precision initially available to us, even in the sciences, is nonquantitative, a matter of careful perceptions judged by reference to exemplary instances.

The birds we saw when my classmates and I took a nature walk in the park stimulate our interest in finding out their names. So we return to the park, but this time equipped with binoculars and copies of a field guide, Kaufman's *Birds of North America.* Before long, I spot a winged creature perched on a nearby branch. We use Kaufman's "pictorial table of contents" to get an initial fix on the sort of bird we are seeing by noting its general size and shape. Not waterbirds, not birds of prey, larger than hummingbirds or warblers, smaller than pigeons and parrots. Among the vast array of the medium-sized birds remaining, our bird's thick beak becomes a first key identifier, pointing us to the part of the field guide for "finches and buntings." Color now begins to be important, and once we have eliminated birds not found in our part of the country, the reddish color around our bird's head suggests it is most likely either a male House Finch or a male Purple Finch. We opt for the latter identification because its head is drenched in the reddish color whereas the top of a male House Finch's head is capped in brown and it has dark stripes on its sides that a Purple Finch lacks. As a clincher, the bird's rich mellow warbling lacks the rough notes with which a House Finch typically ends its song.

We may well have overlooked some important distinguishing feature, especially since some of our judgments were based on the absence of House Finch features rather than the presence of those belonging distinctively to a Purple Finch, and we did not pay attention to subtle issues like the possibility of local variations that would obscure the differences between these two kinds of finch. If we could subject our bird to the quan-

titatively precise analysis a laboratory dissection would offer, the likely accuracy of our identification would increase dramatically. But given our handy field guide and ample opportunity to compare its pictures and text to what we can see of the bird in the tree, our claim that it's a Purple Finch and not a House Finch is reasonable. And so we cheerfully add it to our classroom's Year List.

One of us picks up a grayish rock during our new stroll in the park and wonders what kind of rock it might be. Our teacher suggests that we take it back to our science lab for testing. Close inspection under bright laboratory lights shows that its grayish color is not uniform but a mix of lighter and darker colors, including various bits of what look like shell fragments. It can be scratched easily and when a hammer and chisel are used it splits along fault lines that suggest the rock is sedimentary, built up over time by layer after layer of these materials. There are signs that water has leached grooves in its surface, and at our teacher's suggestion we drip some hydrochloric acid on the rock, which to our delight bubbles on contact.

We take down from our library shelves *Peterson's Field Guides: Rocks and Minerals* and discover that what we have observed suggests the rock is limestone. It could be dolomite, however, which the book says is quite similar except that it has to be ground into powder before hydrochloric acid will make it bubble. We would like to be more confident that the rock isn't dolomite, and so we increase the technical precision of our inquiry by undertaking a chemical analysis, following standard laboratory procedures for doing so. The results indicate that the rock is composed mainly of the mineral calcite: calcium carbonate, $CaCO_3$. That makes it limestone because dolomite includes magnesium as well as calcium, in the form of calcium magnesium carbonate, $CaMg(CO_3)_2$. Thus the precision of our analysis allows us both to be clear about what the rock is and to be able to distinguish it from what it is not, to identify it as limestone rather than dolomite.

The sciences, of course, are not the only areas of learning in which precision emerges out of romance. There comes a time when I and my friends grow bored with bumblebee soccer and want to acquire the skills at which the older children are adept. We have begun to notice that they are always beating us not because they are bigger and stronger but because they can kick the ball more accurately, anticipate our moves better, and sense more quickly when a teammate has become open. Our coach explains that such skills are acquired by practicing them and that

the best form of practice is running precise repetitive drills until our feet and not merely our brains know how to do what needs doing. So we kick the ball at the goal from a variety of different angles, with or without a goalkeeper attempting to block our shot, sometimes from a set location and sometimes after receiving a pass while running an approach pattern—again and again, accompanied by the coach's never-ending words of complaint and praise. And eventually we get better, and after a while move up to a level of play where our newly learned skills are crucial not only to succeed but even just to keep up.

My fascination with the King Arthur legends leads me to wonder if such a king ever lived, if Camelot was a real place and Mount Baden a real battle. A little historical research online and in the local library makes it clear that the legends have some connection to what is known about the ancient Britons. They were conquered in the last century BCE by Roman legions, but in the fourth century CE the legions were withdrawn and the civilized order they had assured disintegrated. In desperation, the Britons invited Saxon mercenaries to help defend against invading Picts to the north. The Saxons then stayed, however, settled on the land with their families, and slowly but inexorably expanded their presence, killing or enslaving whoever stood in their way. The Britons resisted as best they could, and in the fifth century fought a series of battles against the Saxons.

Contemporary reports from these times, I discover, and even relevant archeological findings, are practically nonexistent. The earliest account of the battles makes no mention of a special battle-leader, much less one named Arthur. Only in the ninth century is he mentioned by name and his role described in a single terse sentence. Three centuries later, in 1135, Geoffrey of Monmouth published a history of the kings of Britain, the climax of which is an account of the exploits of the high king Uther Pendragon and his successor King Arthur. According to Geoffrey, Arthur was a skilled military commander and political ruler who extended British hegemony throughout most of western and northern Europe, only to be mortally wounded while suppressing a local rebellion and who, dying, surrendered his crown to Constantine of Cornwall in 542.

By Geoffrey's time, however, legends of Arthur's life and achievements were in plentiful supply and so the factual accuracy of Geoffrey's account is hardly trustworthy. Hence, in trying to be clear about who Arthur really was, I end up needing to distinguish the Arthur of history from the Arthur of myth—and I discover there is little of the former and a great deal of the latter. My interest may then shift to asking about the

origins and development of these legends, and I end up tracing them from Celtic tales through their spread to Normandy and into France, their linkage to Christian myths, and their literary apotheosis in the twelfth-century poetry of Chrétien de Troyes and the fifteenth-century prose of Thomas Malory.

When I build sand castles at the shore, I find myself thinking of them as replicas of Camelot. This leads me to researching the character of medieval castles and discovering that the fourth-century earthen embankment crowned by a timber stockade that Arthur would have built is quite different from the Romanesque structure Geoffrey probably imagined him fashioning or the gothic castle Malory presumably had in mind. I am struck by the architectural and engineering advances that made this shift possible, and begin tinkering with how I make my sand castles to see if by using piers sunk into the sand and by both thickening and doubling the walls I might make them more resistant to the ebb and flow of the waves. And I begin tinkering with the possibility of using flying buttresses instead.

Precision involves not only specifying what a fact is and isn't but also, as Descartes's third step instructs us, specifying its relationship with other facts. Typically, the best way to depict relationships among facts is by organizing them into a coherent and consistent hierarchy. Magnesium and calcium, for instance, are both alkaline earth metals, comprising along with beryllium, strontium, barium, and radium the elements in group 2 of the periodic table. They are all similar in color, hardness, and density, and they all react readily with halogens to form ionic salts and with water to form strongly alkaline bases.

The Purple Finch is one of the twenty-one species of finch comprising the *Carpodacus* genus, which is one of the twenty-two genera that make up the *Fringillidae* family of true finches (some birds are called finches, like the Darwin's Finches of the Galapagos, but are not *Fringillids*). The finch family are passerines, members of the Order *Passeriformes*—perching birds, songbirds—which is the largest order of the class *Aves*, those bipedal, warmblooded, egglaying vertebrate animals that evolved from theropod dinosaurs during the Jurassic period and have flourished from the subsequent Cretaceous period to the present. So *Tyrannosaurus rex* and the *Carpodacus purpureus* are cousins, although *T. rex* and all its other dinosaur relations, excepting the birds, perished in the mass extinction that ended the Cretaceous period sixty-five and a half million years ago.

In my King Arthur explorations, having shifted my focus from the historical facts on which the legends rest to an account of the development

of the legends, I might next return to matters of historical fact and trace the influence of the Arthur myth on British politics and cultural self-understanding. Henry VII, for instance, was trying to solidify the legitimacy of the Tudor dynasty by naming his first son Arthur. I could also move in a quite different direction, however, by exploring how the Arthur legend is a species of a genus of story, that of the culture hero.

Joseph Campbell in *The Hero with a Thousand Faces* argues that Arthur is one of those faces, his story unfolding in accord with the generic account of the culture hero. This story has three main phases: (1) *departure*, in which the hero is called from his everyday life into a perilous adventure, accompanied by a wise helper and possessing a protective talisman—young Arthur called by Merlin from his idyllic life on Hector's farm, drawing Excalibur from the stone as the emblem and instrument of his kingship; (2) *initiation*, in which the hero is faced with many trials, through which he matures and reaches an apotheosis of power or influence—Arthur's foolish affair with Morgause, his battles against pretenders to the throne, his victories over the Saxons, the building of Camelot, and the formation of the Round Table; and (3) *return*, in which the hero's successes lead to a final battle where the hero bestows a special gift on his people—Arthur's battle against Mordred at Camlann, his grievous wound, and his removal by the Lady of the Lake to Avalon with the promise that he will return at some future time should his people need him.

Insofar as the Arthur's story can be interpreted as an instance of the hero myth, Arthur can be compared to other mythic heroes, from Achilles to Luke Skywalker. My understanding of the meaning of the Arthurian legend is thereby deepened, as reciprocally is my understanding of those other legends. Soon I begin asking questions about such legends. They seem so very definitely a product of particular cultures and times, and yet their similarities are so striking and so widespread that it seems unlikely they would have been passed from one culture to another by itinerant bards carried along in the wake of trade or war. Perhaps the hero myth is an archetype, a structural feature of the human mind or, as Jung argues, of the unconscious, a necessary universal core of meaning clothed in the contingent particularities of various cultural tellings of it.

Precision thus provides "both a disclosure and an analysis of the general subject-matter of romance" ("Rhythm" 19). The vagueness is penetrated; boundaries and differences are specified; an ordered system of relationships is imposed, deploying a unitary coherent structure on a raucous multiplicity of particular experiences.

We tend to think of these impositions as cold and impersonal, the subordination of our vital feelings to the formalisms of linguistic grammars and mathematical functions. However, after claiming that a child's "first stage of precision" is "mastering spoken language as an instrument for classifying its contemplation of objects," Whitehead adds that precision is also an instrument "for strengthening its apprehension of emotional relations with other beings" (19). Our emotional as well as our cognitive worlds are strengthened because the generalized patterns of the relationships imposed by precision become tools for linking and then expanding the boundaries of both. As a result, new and sometimes startling connections are discovered and predicted. Who would have thought that *Star Wars* is a retelling of the Arthur myth or that birds evolved from dinosaurs. If birds have feathers, then its ancestral dinosaurs may have been feathered also and not lizard-skinned. If Arthur's story fits Luke Skywalker, maybe it fits us as well, living as we do in these times when our democracy seems especially vulnerable to being transformed into an empire.

New facts will be acquired and our horizons expanded through the analysis and systematizing of vague facts. These facts must be acquired, however, not in the meandering manner of romantic inquisitiveness but methodically: "in a systematic order" (19). Method for Whitehead is "a given way of analyzing the facts, bit by bit," and of accumulating new facts insofar as they "fit into the analysis" (18). Birding can be a serendipitous activity, as it was when our class visited a park and tried to identify whatever bird happened to catch our attention. Ornithologists take a more systematic approach, however, as when they make a survey of bird populations in a given geographic area by mapping the area onto a grid and locating a scientist at each node of the grid for a specified length of time, with instructions to record all the different kinds of birds and the numbers of each that can be seen or heard from that position. This sampling technique lacks the precision available to us in identifying the chemical composition of our rock, but the information is accurate enough to provide, when part of an extended longitudinal study, important facts about increases and declines in species populations.

Just as the stage of romance culminates in the development of habits of imaginative inquisitiveness, in similar fashion precision culminates in accepting the discipline of an established method. We have learned to think and act precisely when we have acquired "the habit of cheerfully undertaking imposed tasks" ("Rhythmic Claims" 35), and thereby have come

to realize "the inescapable fact that there are right ways and wrong ways, and definite truths to be known" (34). Not only do we need to learn how to think systematically and rigorously with regard to any specific area of knowledge, but we also need to learn what constitutes "the best practice" already accepted by experts in that area. "Knowing the subject exactly" means "retaining in the memory its salient features," becoming familiar with "the fundamental details and the main exact generalisations" of that subject area, and "acquiring an easy mastery of [its] technique" (34).

## The Art of Life

Whitehead was dissatisfied with the traditional two-tiered approach to education—romance followed by precision, general education courses followed by work in a disciplinary major, breath followed by depth, first the trivium second the quadrivium. He added a third stage to the process of becoming educated, which he calls the stage of generalization.

This third stage is the "fruition" of the other two, "a return to romanticism with added advantage of classified ideas and relevant technique" ("Rhythm" 19). We are back in the world of romance, a world redolent with important matters for our consideration, significant problems requiring our attention. But now we come furnished with the tools needed to address these issues effectively. Our mind is now "a disciplined regiment instead of a rabble" ("Rhythmic Claims" 37); our forces are ready to be sent into combat. The abstractions of precision, the well-established theories and methods of systematic inquiry, need to be cashed out. "The pupil now wants to use his new weapons. He is an effective individual, and it is effects that he wants to produce" (36–37). The freedom generalization offers a person is "the active freedom of application" (37).

By this recurrent emphasis on activity, Whitehead takes us beyond the academy into the world of practical affairs. The focus is now on using the methods of precision to address the important concerns uncovered in our romantic explorations. My curiosity about limestone led me to analyze its chemical makeup, which I discovered was primarily calcium carbonate. Well, then, to what uses might I put limestone other than for constructing stone fences and the walls of my home or castle? I learn—in an engineering class, perhaps, or as part of on-the-job training, or even, as must have originally been the case, by trial and error—that heating limestone in a kiln to a very high temperature produces a clinker that when ground up

yields cement. Cement is the key ingredient in concrete, which is used in creating barrier fences on highways and constructing the foundations and walls of buildings. These structures are less expensive, more enduring, and more easily formed than if made with slabs of limestone rock.

I can't fulfill my dream of taking part in a field research project in the Montana high prairie digging for dinosaur remains until I have become familiar with the characteristics of the Jurassic and Cretaceous periods with respect to Montana's geology and with the emergence and dispersal of *Theropoda*. This paleogeology and paleobiology also will be helpfully supplemented by what I know about calcium carbonate, because the fossils I seek are calcified organic matter. In the fossilization of an organism's skeletal remains, hard water—water with a high calcium content—typically seeps into the bone structure, slowly replacing the bony material with a precipitate of calcium carbonate. Eventually, the bone is fully replaced by a calcified replica. In extracting a fossil from the ground and in cleaning away the material surrounding it, I would be helped by knowing that I am working with something no longer organic, with rock rather than bone.

My enchantment with Arthurian legends led me to the library where I sought verified knowledge about both the history of Britain during the time when Arthur supposedly flourished and the history of the Arthurian myths themselves. Now the time has come for me to use that research as a tool in my own enterprise. I might write a scholarly essay about one of the Arthurian stories, or a monograph attempting a new assessment of Malory's literary importance, or a book on the quest for the historical Arthur. Alternatively, I might write a novel that re-presents Malory's original story in a contemporary idiom, with or without the magic, or one that transforms it imaginatively by telling it from Merlin's standpoint—or Mordred's. Or I could climb up further on the generalization ladder and become a political theorist, exploring the importance to a people's self-understanding of its myths of national origin. Climbing even higher, I might philosophize about the nature of mythic symbols and their foundational role in the development of other forms of symbolization.

As we move beyond romance and precision into generalization, we find our earlier naive enthusiasms chastened by a recognition that things are more subtle, complicated, and conflicted than we once had thought. In addressing those old romantic concerns, we are more effective because we are clearer about the facts, and because this clarity has uncovered far more facts than we had previously appreciated. But the important contribution of precision to the effectiveness of generalization is not the

facts as such but the systemic structures—the general ideas—by which they are organized.

There is an important difference between accumulating information about a subject and understanding it. The one can be accomplished by rote memorization; the other involves recognizing the principles by which the subject is organized, its cognitive framework. To understand a subject is to see its forest and not just the trees. William Perry tells about a student who wandered into an anthropology class when a test was about to be given, and decided in a fit of whimsy to take it ("Examsmanship"). Asked to discuss two contrasting assessments of a book he knew nothing about, he did so with aplomb and received an A– for his effort. He lacked what Perry calls "cow"—a command of the relevant details—but he was very good at "bull"—seeing or inventing structural relationships that are able to organize the details usefully. Seeing the facts—the trees, the cows—as features of a system that explains them—the forest, the bull—is what makes the difference between a data collector and a scientist, a chronicler and an historian, a diarist and a lyric poet.

In the stage of generalization, "concrete fact" ceases to be in the foreground of our interest, serving primarily "as illustrating the scope of general ideas" ("Rhythm" 26). Likewise, theories cease to be uninterpreted abstractions, serving instead as instruments for guiding our understanding and hence our action, making it possible for us to identify ends worth pursuing and then effectively to achieve those ends. Putting general ideas into practice takes practice, however. Generalization involves "comprehension of a few general principles with a thorough grounding in the way they apply to a variety of concrete details" (26).

Whitehead wants us to be so thoroughly at home among both particular facts and general ideas that seeing their interdependence has become a habit. He defines a general principle as "rather a mental habit than a formal statement." It is "the way the mind reacts to the appropriate stimulus in the form of illustrative circumstances" (26). This active application of principles involves "shedding details" in the sense that we cease to focus on the specific technical terms, the individual steps in a procedure, the mathematical formulae by means of which the principle is formally expressed. Instead, we adapt its essentials in fashioning directly relevant contextualized interpretations with "the details retreating into subconscious habits" ("Rhythmic Claims" 37). Learning should culminate in the achievement of "active wisdom," which is "a preparation for battling with the immediate experiences of life, a preparation by which to qualify each immediate moment with relevant ideas and appropriate actions" (37).

On our stroll toward the park, none of us is able to identify a bird high in the sky over a nearby open field because it is too far away, appearing as little more than a black dot. Our teacher, more skilled than us in identifying birds, calls it a Red-tailed Hawk. Not because she can see the dot any more clearly than we can, but because she can read very subtle clues provided by its shape and flight style, and because she knows that Red-tails are the predominant raptors in our area this time of year. She brings to the identification an orienting sense of location probabilities and behavior patterns that is lacking in us novices whose birding skills are limited to a handful of good looks at a few birds and a mental list of a dozen or so bird species with the four or five distinguishing color and shape features of each.

This generalization skill is also illustrated in an athlete's awareness of the whole field of play. The ability of a center midfielder in soccer to see opportunities developing as teammates and opponents quickly alter their relative positions and likely trajectories involves having what seems often to be a fish-eye view of the total dynamic field of interactions. It's one thing to know how to execute effectively a tricky heel kick or to bend a shot accurately into the far upper corner of the net; it's another thing to see the split-second opening that calls for just such actions. This constant alertness to contextual relevance is what the stage of generalization means: an integration of information and interpretation, of technique and timing, into an effective game-tested style of problem solving.

So once again, the development of a habit is key to the stage of learning. In this case, however, the habit is explicitly dynamic, and necessarily so. Generalization is "the habit of the active utilisation of well-established principles" (37), "the habit of active thought, with freshness" (32). The practical world of our daily lives is dynamic, constantly rendering old truths uncouth, constantly requiring the deployment of new methods, better theories, and more relevant facts. So the habits of romance and precision, when yoked in the service of the habit of generalization, effectively putting our knowledge to work to solve important problems, must be a habit of transcending old habits toward more adequate ones. Generalization involves the habitual reformative critique of established habits.

Thus, for Whitehead, general principles are not mental habits in a sense that would suggest they are unthinkingly utilized. The habit crucial to generalization is the habit of using principles that are themselves altered as they are used to alter things. Confronted with a task, whether a problem or an opportunity, our more particular principles will be brought into

play as part of our habitual use of a repertoire of workable ideas; but this application will be done critically, the particular relevance of the principles routinely under scrutiny, their coherence and consistency always open to revision. Similarly, the retreat of details into subconscious habits is not a process by which the details become unimportant but one in which their importance lies not in their isolated features but in their relevance to the applicability and adequacy of the principles they putatively illustrate and so constantly test.

Generalization is "active mastery" of knowledge, "knowledge so handled as to transform every phase of immediate experience" ("Rhythmic Claims" 32). To be attempting always to frame afresh some suitable interpretation of facts, which facts are always then being brought forward to be tested afresh against that interpretation, is to attain the apotheosis of "mental cultivation." It is "the satisfactory way in which the mind will function when it is poked up into activity" ("Rhythm" 27). The habit of generalization is a way of life, a style of engagement. It has to do not with what we know but with how we put our knowledge to use, so that it both achieves our immediate ends and, by criticizing our way of doing so, improves the chance for achieving our subsequent ends.

Generalization's practical orientation does not mean it has no place in formal education, that it belongs solely to the world beyond the walls of academe. Rather, Whitehead identifies university education as "the great period of generalisation" ("Rhythm" 25), chastising professors for constantly succumbing to the temptation to turn it into an extension of secondary school where romance and precision predominate. For the task of a university is to give students the opportunity to practice generalization until it becomes their second nature. "The ideal of a University," Whitehead argues, "is not so much knowledge, as power. Its business is to convert the knowledge of a boy [or girl] into the power of a man [or woman]" (27).

In the practical contexts of classroom instruction and curriculum design, helping students learn how to become effective generalizers can most readily be implemented through some form of interdisciplinary effort. Take, for instance, a university course in which our professor has me and my classmates investigate an issue that has not been predefined by a traditional expertise—a so-called real world problem, a public issue of local or national or international importance, a perplexing task commonly agreed to be worthwhile but for which there is no agreed-on method for approaching it. Addressing such a topic requires the collaboration of vari-