

Introduction

HERE I WANT to provide a fairly abstract epitome of the themes of toolishness, marginalism, and discontinuity. And then I want to look briefly at a countertheme, that of middles, mixtures, and transitionality.

Taking the World Toolishly. Toolishness is a vital theme in twentieth-century thought, transforming the Kantian transcendental categories concerned with perception and cognition into categories of action, intervention, and construction and repair. Tools are modular, they get around the subject-object dichotomy much as do the transcendental categories, and they are instantiated in vivid examples that “everyone knows.” They provide a way of thinking about the task of constructing reality, acknowledging that the world is stubborn and resistant and not under our command.

We have a craft of knowledge. We get ahold of the world and we craft explanations by taking the world toolishly, the tools being archetypes, models, and mathematics. Surely those tools are things, but they are functions as well. For a tool lets me get at the world; it provides me with a handle onto it. The tool then disappears behind that world it allowed me to get a handle onto. For I am involved in the world, not with the tool as such. I only discover the tool as such when it does not work or when it breaks down, as Heidegger pointed out. I work within a concrete, practical situation, which is an example of that tool in its application.

Tools are usually employed automatically, without a second thought. So a description of tools and how they are used should strike practitioners as an “of course” and a “so what?”—as true to life but unremarkable. Methodology, how these tools are used as tools, is just what everyone knows. Craftspersons may recall the awkwardness of their apprenticeships, and even those times when they self-consciously or playfully or tentatively tried out a tool. But those are the exceptional moments.

Now the archetypes and models, as tools, never do address what the world is really like—except that it is subject to being taken toolishly, and by these tools. Still, we take their provision of the world as real enough, even if there is misfit and error, as there surely will be.

Toolishness allows us to make claims about how and whether the

world can be repaired, tuck-pointed, or put together out of added-on bits and articulated pieces, rather than be started anew with virgin land, fresh plans, and new lumber. And phenomenological and methodological descriptive tasks supplant traditional dialectical oppositions such as that of smoothness and discontinuity, the profane and the sacred, or flow and discreteness. Consequently, the world's nature is often seen to be ironic. For marginal additions can add up, in the limit, to discontinuity; everyday mundane life can lead to transcendence; and flows can crystallize into discreteness.

The world as these particular tools tend to get ahold of it is characterized fully by its present properties. Those properties are congruent to the crucial features of the tool, whether it be a model, an archetype, or mathematics: The world is as we get ahold of it. And the world's history, how it got to this state, is in effect effaced and of no consequence. Such path independence or invariance is quite remarkable, for usually history matters unavoidably. When cooking or baking, for example, just how we combine ingredients is often critical to the outcome.

Taking the world toolishly is a condition for there to be explanations. For by their actual employment in constructing something, tools provide linked sets of actions that lead to what is to be explained. And so we have a sequentially cumulative account, an explanation. Tools also encourage well-defined notions of causality: mechanically, hit it and see what happens; archetypally, embark on a patterned transformation. We might give a history of natural science as the gradual ascendance of toolish answers over metaphysical ones to questions such as: How does the complex world exhibit local simple linear phenomena? How does an atomic world exhibit both smoothness and discontinuity? Of course, to answer these questions has required some remarkable inventions, such as the economist's Invisible Hand and the physicist's cooperative phenomenon.

Toolishness also encourages us to ask about what people actually do, their actual practice. Historical study of specific tools and applications will show just how these tools and applications are made to fit each other. In this context, if we ask why mathematics works, we are asking just how is it made to work. Now it turns out that the fit between tool and application is perhaps not so natural as it appears at first. Much has to be discarded if we are to have intellectual vestments that are wearable at all. Of course, one still might argue whether mathematical objects are discovered or invented, and still be amazed at the fit between mathematics and natural science. But now the question is set in a less fantastic light.

In describing what people actually do, I take what might be called a nominalist view of tools. Tools, models, and functions are known through their panoply of concrete interpretations within specific occasions, contexts, and situations. So a random walk is thought of as Brownian motion, or as a sequence of coin tosses, or as diffusion. And architects have a canon of specific buildings in mind when thinking of a church. In practice, I am likely to test out my ideas on a range of specific pictures and examples. Hence, a phenomenology of toolishness not only provides a description of how we encounter the world in terms of tools, but is an account of their application.

Tools are employed in subtly different ways in each context, yet a tool's versatility still tempts us to think it has an abstract quality or nature which is then to be applied to a situation. So drawing from particular cases, we may show which formal abstract features of the calculus, such as the Fundamental Theorem, make it so widely applicable. Still, we come to appreciate the power and meaning of the Fundamental Theorem only when we keep in mind its application.

Any synthesis of the tools or models, a theory say, would be a curiosity without our immediately being able to visualize exemplary real fruit growing on this tree of organized knowledge. But sometimes the best one can do for a synthesis is a list of tools or a toolkit. For lists are a way of organizing incongruities and similarities, without insisting on their precise relationship.

For our purposes, a number of examples have proved to be seminal, and they reappear in a variety of guises and circumstances. There is the rite of passage represented by religious conversion; the phase transitions represented by iron becoming permanently magnetizable, by water freezing, and by the onset of epidemic or percolation; the marginal, additive, and invariant connection of parts to wholes represented by the Fundamental Theorem of the calculus; metastability as represented by the buckling of a beam; marginalism as represented in a market economy at equilibrium; the curious effects of combination as represented in perturbed random processes; and the creation of something from nothing represented by the entrepreneur.

Marginalism and Discontinuity. Like most influential ideas, marginalism and discontinuity are meaningful within a historically developed set of dialectical tensions and within the set of situations in which they have been instantiated. The tensions, some of which we have already mentioned, include those between smoothness and discontinuity, flow and discreteness, the little-commensurable-additive and the big-incommensurable-unique, the gradual and the emergent, the profane and the sacred, the ordinary and the stigmatized, parts and

wholes, the eternal and the historical, and the soul-less and the animated:

- Is each part of the world smoothly and gently connected to another part, marginally or incrementally different from it, the parts being mutually commensurable, perhaps on a linear gently graded scale—the Great Chain of Being? Or are there abrupt jumps, discrete classes, distinct qualities?

Is the material world accounted for by a story of flows and of added-on infinitesimals or small discrete parts, a matter of smoothness and marginalism? Or are its wholes emergent, discontinuously related to their putative atomic components? Are both stories true?

- Is history continuist, a matter of degree and small alterations? Or is it marked by breaks and by destruction, disruption, and invention? Are revolutions turnings or overturnings? Is it a Marshallian world, or a Schumpeterian one defined by “creative destruction”?
- Is our culture and toolkit one of partial derivatives, analyticity, locality, exchange, and independent parts? Or is it a culture and toolkit of fluctuation, taboo, preemptive moves, historical memory, emergence, and conversion? Either of these toolkits can be employed to construct the discrete individuals and fetishes which are meant to add up the world.

My main concerns here will be with how marginalism allows us to add up the world; how discontinuity is to be modeled as real and authentic, yet how it is also to be modeled as a limiting consequence of a sum of marginal influences; and how discreteness and animation are a product of our setting up the world in particular ways. Arithmetic addition is attractive as a mode of explanation or accounting because it is an algorithmic process—if you follow the rules you get to the sum. And marginalism and the calculus provide a prescription for defining the little pieces, one that ensures their adding up.

Our commitments to marginalism, discontinuity, and toolishness, and to their dialectical interaction, are in the best sense methodological prejudices—commitments that then allow us to get down to work. Each of those commitments is experienced phenomenologically as authentic and real. Yet we then may shift or transcend our commitments.

For example, in the scientific and humanistic traditions discontinuity and transcendence are taken to mark off what is beyond knowledge. But we then go on to getting ahold of what is beyond, the best we

can. We teach ourselves to divide the world into mundane dumb parts—as discrete components or as marginals—that we may then put together or literally add up so as to recompose the world's discontinuities. And we learn to act out rites of passage, atone for violations of taboo, and taste what is beyond in conversionary moments of ecstasy, and so transcend absolute division and prohibition.

We go beyond “in the limit,” so to speak. Molecular accounts lead to orderly equilibria as in markets and gasses, as well as to discontinuity as in freezing and spontaneous magnetization—in the limit of large numbers and volumes. Marginal accounts, as in the integral and differential calculus, add up or balance out the world—in the limit provided by smoothness and continuity. The conventions and rituals enacted in the mundane everyday world lead us to the sacred, the transcendent, and the archetypal—in the limit of faith, ritual and community, and grace. Of course, it is just these various limits which have defined the scientific and humanistic traditions—whether the limits be a matter of the Invisible Hand, random statistical processes, symmetry, scaling and the Great Chain of Being, infinitesimals and the calculus, or God.

As for the division of the world into dumb and discrete parts, the trick is to employ a mechanism that automatically does the work of classification, individuation, and aggregation. Then the world is set up to be dumb in the requisite way. In physics, economics, biological systematics, and kinship, the mechanisms are atomic interactions and phase transitions, market exchanges by rational economic individuals, reproduction and natural selection, and marriage. And those mechanisms lead to boundaries and interfaces that define discrete classes which organize a system and a culture and a society—of physical states or phases and particles, economic structures and institutions, species, and families. Those boundaries then define modes of interaction among the individuals, interactions which in their totality or plenitude confect the world as we have it. Similarly, fetishes, whether sexual or commodity or religious, are condensations onto putative discrete individuals of global or distributed features. These individuals then define forms of two-body interaction, whether literally corporeal, or as in billiard balls in collision, or in markets with buyers and sellers, or in rituals, which then in their totality reproduce a more complex system.

To create collective objects which act as individuals, out of interacting atomic objects, we set up conditions so that there are centers, such as cities or phases or an oeuvre, centers which may be spatial or conceptual. For example, if there is equilibrium and a proper range of

temperature and pressure, there will be a stable separation of groups of atomic constituents into aggregates such as thermodynamic phases or elementary particles. We may then think of these centers as individuals. And often those individuals will interact smoothly with other such individuals, and be appropriately dumb and addable.

Ours is a story of analysis and diremption redeemed by synthesis and a sacred wholeness, and a story of the synthetic and sacralized dismembered or disenchanting by toolish manipulation and analytic thought.

Transitionality. These various contrasts and tensions provide a powerful analytic framework. Were we perspectivalists we might say that from one point of view we see discontinuity and from another we see smoothness and marginalism—each point of view being legitimate. So, for example, atomically we see discreteness, while collectively and statistically we see smoothed and averaged quantities.

As indicated already, in the limit, and in actual life and work, these various contrasts and the historical dialectic they represent may be transcended. Much of everyday life is in between, “transitional” in D. W. Winnicott’s phrase, not at all well understood in terms of division *or* wholeness, discontinuity *or* smoothness. Rather than either-or we have both-and: discontinuity and smoothness, the sacred and the mundane, the individuated and the homogeneous, apocalyptic doom and practical problem solving, playing and reality. The world is inseminated by ambiguity, complexity, contradiction, and polysemy.

Transitionality is perhaps most fully realized when we consider an infant and his mother or father. The dialectical tensions are not to be resolved perspectively. (Here I follow Winnicott.) The breast or bottle is and is not under the infant’s control, the parent is and is not other to the infant. There is a neutral area of experience between me and not-me, the thumb and the teddy bear, the subjective and the objective—experienced as in-between. In that area the breast *is* how it functions—and so it is both the baby’s and the mother’s. And the “good-enough” father or mother is available and responsive, objectively there but subjectively re-created each time by and for the infant. The parent actively adapts to the infant’s needs, has an easy and unresentful preoccupation with him, is devoted to the infant. In that middle ground the parent is in touch with his child, paying attention to subtle details, the ones that say what is going on. Dependence and independence are not distinguished, nor need they be.

Such a middle ground is a rather more general phenomenon. Anthropologists and psychologists describe it as a margin between ordinary states, when contradictions are breached and categories are

mixed, as in the middle of a rite-of-passage ritual. Historians and novelists describe periods of turning in their narratives, when what is happening is subject to the incommensurable interpretations of before and of after.*

Tools might be taken as transitional—determined by context and interpretation, subjective and objective, functions and things—and a toolkit might be taken as good-enough. And we may take our work as matters of craft and design. What the world is is what we can make of it, our actively adapting to its needs, being devoted to the work at hand. And the archetypes and models and tools feel as concrete and real as any breast or bottle ever felt.

Let us now turn to these tools and see how they do their work.

*I have given a variety of descriptions of that middle ground in a previous book, *Advice and Planning*.