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## WALKING THE PLANK

### MEDITATIONS ON A PROCESS OF SKILL



Was there ever a bookcase that gave a fraction of the satisfaction as the one fashioned by your own hands?

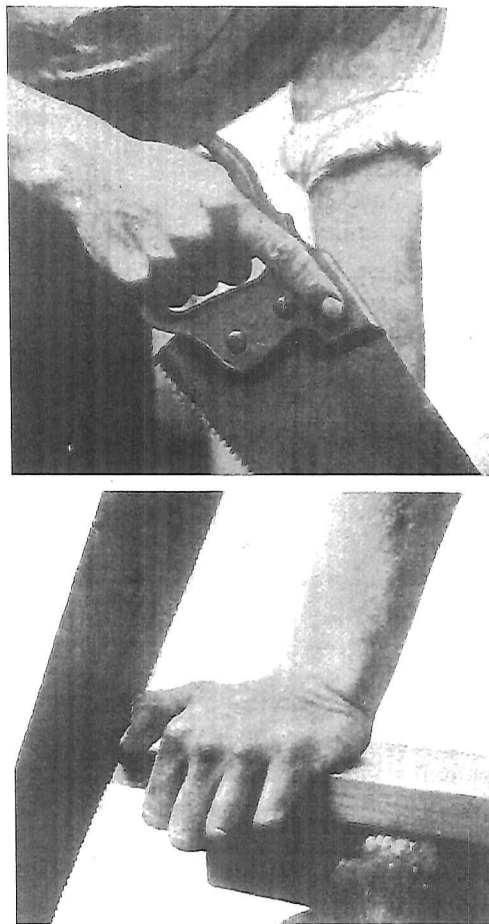
The Editor, *The Handyman and Home Mechanic*

#### On sawing a plank

I am making a bookcase from wooden planks. Each shelf has to be cut to the right length. Marking the distance along the plank with a tape measure, I use a pencil and set square to draw a straight line across it. After these preliminaries I set the plank on a trestle, lift my left leg and kneel with as much of my weight as I can upon it, while keeping my balance on the ground with my right foot. The line to be cut slightly overhangs the right end of the trestle. Then, stooping, I place the palm of my left hand on the plank just to the left of the line, grasping it around the edge by the fingers. Taking up a saw with my right hand, I wrap my fingers around the handle – all, that is, except the index finger, which is extended along the flat of the handle, enabling me to fine-tune the direction of the blade (Figure 4.1, top).

Now, as I press down with a rigid arm on the left hand, I engage the teeth of the saw with the edge, at the point where it meets my drawn line, and gently nick the edge with two or three short upstrokes. To guide the saw at this critical juncture, I bend the thumb of my left hand, so that the hard surface of the joint juts out to touch the blade of the saw just above the teeth (Figure 4.1, bottom). Once the slot in the edge is long enough that there is no further risk of the saw jumping out and lacerating my thumb, I can begin to work it with downward strokes. At this point I have to attend more to the alignment of the blade than to the precise positioning of the teeth, in order to ensure that the evolving cut proceeds in exactly the right direction. To do this, I have to position my head so that it is directly above the tool, looking down. From this angle the blade appears as a straight line and I can see the wood on either side of the cut.

The first strokes are crucial, since the further the cut goes, the less room there is for manoeuvre. After a while, however, I can relax my gaze and settle down to a rhythmic up-and-down movement with long, smooth and even strokes. Though delivered to the saw



**FIGURE 4.1** The correct way to hold a saw (top) and how to use the thumb and left hand as a guide when beginning the cut (bottom). Reproduced from *The Handyman and Home Mechanic* (London: Odhams Press).

through the right hand and forearm, the movement is actually felt throughout my entire body in the oscillating balance of forces in my knees, legs, hands, arms and back. The groove I have already cut now serves as a jig that prevents the saw from veering off the straight line. Because of the way the saw's teeth are cut, they slice the wood on the downward stroke, whereas the upward stroke is restorative, returning the body-saw-plank system to a position from which the next cycle can be launched. However, a good saw requires little or no pressure on the downstroke, and works under its own weight.

Although a confident, regular movement ensures an even cut, no two strokes are ever precisely the same. With each stroke I have to adjust my posture ever so slightly to allow for the advancing groove, and for possible irregularities in the grain of the wood. Moreover I still have to watch to make sure I keep to the line, since even though the saw is constrained to slide within the existing groove, the groove itself is slightly wider than the blade, allowing for some slight axial torque. This is where the index finger of my right hand, stretched along

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the handle of the saw, comes into play (Figure 4.1, top). In effect I use it to steer within the tight margins afforded by the groove. The actual width of the groove is determined by the setting of the saw's teeth, which are bent outwards, alternately to one side and the other of the blade. The point of this is that it allows clearance for the blade to slide within the groove. It would otherwise become jammed.

As I approach the end of the line, a marked drop in the pitch of the sound created by my sawing, caused by a loss of tensile strength in the plank, serves as an audible warning to slow down. Once again I have to concentrate on the cutting edge. For a clean finish, the last few strokes are as critical as the first. To prevent the free end from breaking off under its own weight, leaving a cracked or splintered edge, I must shift my left hand to the right of the groove, no longer pressing down on the plank but supporting it. At the same time I saw ever more slowly and lightly until, eventually, the cut end comes free in my left hand and I allow it to drop to the ground.

This description of a quite elementary episode of tool use might seem unnecessarily elaborate. It serves, however, to illustrate three themes of fundamental significance for the proper understanding of technical skill. These themes concern: (i) the processional quality of tool use, (ii) the synergy of practitioner, tool and material, and (iii) the coupling of perception and action. In the following sections I elaborate on each theme in turn, using the example of sawing a plank for purposes of illustration. I conclude with some remarks on the fate of skill in a world increasingly engineered to the specifications of technology.

### The processional quality of tool use

The use of a tool is commonly understood as a discrete step in an operational sequence, a *chaîne opératoire*, one of a number of such steps that together comprise a schedule for the assembly of a complete object like a bookcase. It does not take just one step, however, to saw a plank. It takes many steps; moreover these steps are no more discrete or discontinuous than those of the walker. That is to say, they do not follow one another in succession, like beads on a string. Their order is processional, rather than successional. In walking, every step is a development of the one before and a preparation for the one following. The same is true of every stroke of the saw. Like going for a walk, sawing a plank has the character of a journey that proceeds from place to place, through a movement that – though rhythmic and repetitive – is never strictly monotonous.

The journey does have recognisable phases – of getting ready, setting out, carrying on and finishing off – and these lend a certain temporal shape to the overall movement. These phases are not, however, sharply demarcated. When, leaving the front door of my house, I turn the corner into the street, I alter my pace and gait, and lift my sights from the immediate vicinity of the doorstep to the longer vista of the pavement. The movement, nevertheless, is continuous. It is the same with sawing. Like turning a corner, the initial nicking of the edge of the plank leads into the smooth downward strokes of the cut through an unbroken transition. Only when I look back on the ground covered can I say that one phase of the process is finished, and another has begun. The same is true of the process as a whole. When do I begin to saw? Is it when I mark the line, when I rest my knee and hand on the plank, when I nick the edge, or when I commence the downward strokes? And when do I cease? Perhaps, having cut through the plank, I lay down the saw, but this may only be to pick up the next piece to be cut. In sawing as in walking, movement always overshoots its destinations.

Let us take a closer look at the four phases of the process, beginning with 'getting ready'. Even before setting out I need to have arrived at some overall conception of the task to be performed – of what is to be done, how to do it, and the tools and materials required. This conception covers an assortment of factors that are only loosely connected, and serves to guide the work rather than strictly to determine its course. Charles Keller, a pioneer in the anthropological study of cognition in practice, aptly calls it an 'umbrella plan', an idiosyncratic constellation – peculiar to each practitioner – of stylistic, functional, procedural and economic considerations assembled specifically for the task at hand (Keller 2001: 35). Though the composition of the umbrella plan calls for forethought, such thinking is itself a mundane practical activity, set in the context of the workplace, rather than a purely intellectual, 'inside-the-head' exercise (Leudar and Costall 1996: 164). It includes, for example, 'sizing up' the planks, deciding which to select for the shelf I want to cut and which to reserve for other purposes, so as to minimise the waste from offcuts. It also includes the retrieval of the saw and trestle from where I last put them, so that I have them to hand for when the cutting is to begin. Even drawing the line across the plank, with pencil and set square, can be understood as part of the planning process, a 'measuring out' that is done not in advance of engagement with the material but directly, at full scale, on the material itself. Crucially, the pencil line can be erased. While inscribed *on* the material, it is not, like the subsequent cut, indelibly incised *into* it. Evidently, then, the umbrella plan is in no sense confined within the mind of the practitioner. On the contrary, it is laid out over the workplace itself: in the marking up of the materials and in their disposition in relation to the body of the practitioner and the tools that he will bring to bear on them.

There is a critical moment, in implementing any task, when getting ready gives way to setting out. This is the moment at which rehearsal ends and performance begins. From that point on there is no turning back. Pencil marks can be rubbed out, but an incision made with the blade of a saw cannot be contrived to disappear. The skilled practitioner chooses his moment with care, knowing that to set out before one is ready, or alternately to allow it to pass unnoticed, could jeopardise the entire project. The Ancient Greeks had a word for this moment, namely *kairos*. As the classical scholar Jean-Pierre Vernant explains:

In intervening with his tools, the artisan must recognise and wait for the moment when the time is ripe and be able to adapt himself entirely to the circumstances. He must never desert his post ... for if he does the *kairos* might pass and the work be spoiled.

(1983: 291–292)

This moment of setting out, however, is also marked by a switch of perspective, from the encompassing view of the umbrella plan to a narrow focus on the initial point of contact between tool and material. Thus my attention, in setting out to saw a plank, is fixed on that constricted space between where the teeth of the saw meet the edge of the plank, where the edge of the plank is gripped by the fingers of my left hand, and where the joint of my left thumb guides the blade of the saw (Figure 4.1, bottom). For that brief interval while I nick the edge with a series of short, upward strokes, my overall conception of the work fades into the background as I concentrate on the precise details of the emergent cut. There is a certain tension in these initial movements – each is like a gasp, a sudden intake of breath, that runs counter to the direction in which the saw is disposed to run, and in which the wood

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is disposed to receive it. The wood resists, and seems to want to expel the saw by causing it to jump out.

It is when I reverse the rhythm, cutting with downstrokes rather than upstrokes, that setting out gives way to carrying on. The reversal is somewhat analogous to what happens when I set out with a rowing boat from the shore, turning from the initial and rather awkward pushing of the oars in back stroke to the more comfortable and efficient movement of pulling once a sufficient depth of water has been reached. In sawing, as in rowing, from that moment on it seems that I am working *with* the instruments and materials at my disposal rather than *against* them. Although I am of course cutting the plank against the grain, the wood nevertheless 'takes in' or accommodates the saw along the line that I have already cut, and yields to its movement rather than repelling it. In duration the phase of carrying on is generally the longest, and it can call for considerable strength and endurance. But it is also the most relaxed, flowing in a smooth legato rhythm that contrasts markedly with the abrupt staccato passage of setting out. At the same time my focus also shifts, from the point where the drawn line meets the edge to its entire length, and from the detail of the saw's teeth to the alignment of the blade as a whole. So it continues, until I reach the phase of finishing off. There is no precise moment when carrying on ends and finishing off begins, but rather a point of inflection from which the movement is gradually retarded and its amplitude diminished. Simultaneously, my attention begins to shift from the line of the cut to its destination, where it intersects the trailing edge of the plank.

It is commonly supposed that each stage in the process of making an artefact is completed at the point when the material outcome precisely matches the maker's initial intention. Holding an image of the intended outcome at the forefront of his mind, the maker is said to measure his progress against the extent to which it has been realised and to cease once he has achieved a result congruent with the image. In practice, however, it is not the image of the end product that governs the phase of finishing off. By the time this phase is reached, any deviations from the initial plan will have been either accepted or corrected (Keller 2001:40). If I have kept my saw to the drawn line, then I need have no further concern that it might deviate from it; if I have not, then it is far too late for remedial action. Yet the judgement of when and how to finish can be just as crucial as choosing the moment to set out. To reach this judgement the practitioner must once again focus down on the finer details of the work. Keller's examples are drawn from the crafts of the weaver and the silversmith. The weaver has to decide at what point no more weft strands can be added; the silversmith how many more hammer blows the metal will take without cracking. Likewise in sawing a plank, to obtain a clean cut the final strokes must be finely judged such that one reaches the edge without actually sawing through it. Thus the end of the line is approached as an asymptote: the closer I come to it, the gentler and more delicate my strokes, and the more my attention is focused on the finishing point, until eventually the free end comes loose in my hand.

Finally, journey completed, I put away my saw and place the plank, now cut to the right length, where it will next be needed. Yet this placement of tools and materials is already part of the formation of the umbrella plan for the next operation. Putting things away in the right places is a way of getting ready. Thus in the use of tools, every ending is a new beginning.

### The synergy of practitioner, tool and material

What does it mean to say that in carrying out some task, a tool is used? We might suppose that use is what happens when an object, endowed with a certain function, is placed at the disposal of an agent, intent on a certain purpose. I want to cut a plank, and I have a saw. So I use the saw to cut the plank. However, from the account I have already presented it is clear that I need more than the saw to cut wood. I need the trestle to provide support, I need my hands and knees respectively to grip the saw and to hold the plank in place, I need every muscle of my body to deliver the force that drives the saw and to maintain my balance as I work, I need my eyes and ears to monitor progress. Even the plank itself becomes part of the equipment for cutting, in that the evolving groove helps to guide the work. Cutting wood, then, is an effect not of the saw alone but of the entire system of forces and relations set up by the intimate engagement of the saw, the trestle, the workpiece and my own body. What then becomes of our concept of use? To answer this question we need to consider three things. First, what does it take for an object of some kind, such as the saw or trestle, to count as a tool? Secondly, how does the instrumentality of the tool compare with that of the human body with which it is conjoined? And thirdly, can this conjunction be considered apart from the gestural movements in which it is set to work?

No object considered purely in and for itself, in terms of its intrinsic attributes alone, can be a tool. To describe a thing as a tool is to place it in *relation* to other things within a field of activity in which it can exert a certain effect. Indeed we tend to name our tools by the activities in which they are characteristically or normatively engaged, or by the effects they have in them. Thus to call an object a saw is to position it within the context of a story such as the one I have just told, of cutting a plank. To name the tool is to invoke the story. It follows that for an object to count as a tool it must be endowed with a story, which the practitioner should know and understand in order to recognise it as such and use it appropriately. Considered as tools, things *are* their stories. We are of course more accustomed to think of tools as having certain functions. My point, however, is that the functions of things are not attributes but narratives. They are the stories we tell about them. This point, I believe, resolves a paradox that has long bedevilled discussions of the concept of function. The dictionary defines function as 'the special kind of activity proper to anything; the mode of action by which it fulfils its purpose'. Thus the function of the saw is to cut wood: this is the activity traditionally deemed 'proper' to it, and for which it has been expressly designed. Yet as David Pye has observed, nothing we design is ever truly fit for purpose. A saw that really worked would not produce quantities of sawdust. The best we can say of its function is that it is 'what someone has provisionally decided that [it] may reasonably be expected to do at present' (Pye 1978: 11–14). So if we were to decide that the saw should be used, in a quite different context, as a musical instrument, that should count just as well. How can the idea that every tool has a proper function be reconciled with the fact that in practice, nothing ever works except as a component of a system constituted in the present moment (Preston 2000)?

The parallel between tool use and storytelling suggests an answer. As I shall show in Chapter 13 (p. 162), the meanings of stories do not come ready-made from the past, embedded in a static, closed tradition. Nor, however, are they constructed *de novo*, moment by moment, to accord with the ever-changing conditions of the present. They are rather discovered retrospectively, often long after the telling, when listeners – faced with circumstances similar to those recounted in a particular story – find in its unfolding guidance on how to proceed.

Now just as stories do not carry their meanings ready-made into the world so, likewise, the ways in which tools are to be used do not come pre-packaged with the tools themselves. But neither are the uses of tools simply invented on the spot, without regard to any history of past practice. Rather, they are revealed to practitioners when, faced with a recurrent task in which the same devices were known previously to have been employed, they are perceived to afford the wherewithal for its accomplishment. Thus the functions of tools, like the meanings of stories, are recognised through the alignment of present circumstances with the conjunctions of the past. Once recognised, these functions provide the practitioner with the means to keep on going. Every use of a tool, in short, is a remembering of how to use it, which at once picks up the strands of past practice and carries them forward in current contexts. The skilled practitioner is like an accomplished storyteller whose tales are told in the practice of his craft rather than in words. Thus considered as tools, things have the same processional character as the activities they make possible. As we have seen, the activity of cutting a plank is more a walk than a step. Similarly the function of the saw lies more in a story, or perhaps a series of stories, than in a set of attributes. Functionality and narrativity are two sides of the same coin.

Yet although the saw, both in its construction and in its patterns of wear and tear, embodies a history of past use, it remembers nothing of this history. Indeed it remembers nothing at all. And this suggests an answer to our second question. We have already seen that to cut wood, a saw is not enough. At the very least, the saw is gripped by hand and watched by eye. How, then, does the use of these bodily organs compare with the use of extra-somatic equipment such as the saw? In his essay on body techniques, ethnologist Marcel Mauss declared that the body is 'man's first and most natural technical object, and at the same time technical means' (Mauss 1979: 104). But if using the hands to grip and the eyes to watch, and even the brain to think, is tantamount to converting them into objects of my will, then where am *I* the subject, the user of these bodily means? Should we, like Mauss, follow Plato in supposing that the entire body, and not just the tools that serve to extend the range and effectivity of its actions, is the instrument of an intelligence that is necessarily disembodied, and that stands aloof from the world in which it intervenes? Or should we rather find an alternative way of thinking about use that does not presuppose an initial separation between the user and the used, between subject and object? Perhaps it would be better to say that in an activity like cutting wood, my hand is not so much used as brought into use, in the sense that it is guided in its movements by the remembered traces of past performance, already inscribed in an accustomed – that is *usual* – pattern of dextrous activity (Ingold 2000a: 352). But if the hand, as it drives the saw, remembers how to move, the saw it grips does not. For *only the body remembers*. Thus in the relation between hand and saw there lies a fundamental asymmetry. The hand can bring itself into use, and in its practised movements can tell the story of its own life. But the saw relies on the hand for its story to be told. Or more generally, while extra-somatic tools have biographies, the body is both biographer and autobiographer.

If an object such as a saw, however, becomes a tool only through being placed within a field of effective action, then the same goes for the organs of the body. In his massive work, *Gesture and Speech (Le Geste et la parole)*, André Leroi-Gourhan – himself a student of Mauss – observed that it is in what it makes or does, not in what it is, that the human hand comes into its own (Leroi-Gourhan 1993: 240). Where the tool has its stories, the hand has its gestures. Considered in purely anatomical terms, of course, the hand is merely a complex arrangement of bone and muscle tissue. But the hands I use in sawing are more

than that. They are skilled. Concentrated in them are capacities of movement and feeling that have been developed through a life history of past practice. What is a hand if not a compendium of such capacities, particular to the manifold tasks in which it is brought into use, and the gestures they entail? Thus while hands make gestures, gestures also make hands. And of course they make tools too. It follows that gesture is foundational to both toolmaking and tool use. The point would be obvious were it not for a certain conceptual blindness, which causes us to see both bodies and tools out of context, as things-in-themselves (Sigaut 1993: 387). We have therefore to be reminded that 'bringing into use' is a matter not of attaching an object with certain attributes to a body with certain anatomical features, but of joining a story to the appropriate gestures. *The tool, as the epitome of the story, selects from the compendium of the hand the gestures proper to its re-enactment.* Yet the tool has its story only because it is set in a context that includes the trestle, the wood, and all the other paraphernalia of the workshop. And the hand has its gestures only because it has grown and developed within the organic synergy of practitioner, tool and material. The practice of sawing issues as much from the trestle and plank as from the saw, as much from the saw as from the carpenter, as much from the carpenter's eyes and ears as from his hands, as much from his ears and hands as from his mind. You only get sawing when all these things, and more, are bound together and work in unison.

### The coupling of perception and action

Close examination of a carpenter at work reveals an apparent paradox. In sawing, as I have already observed, no two strokes are precisely the same. In its oscillations the right hand – alternately driving the saw down and pulling it back up – never follows an identical trajectory. The force, amplitude, speed and torque of the manual gesture vary, albeit almost imperceptibly, from stroke to stroke. So also does the posture of the body, and the muscular–skeletal configurations of tension and compression that keep it in balance. Yet the outcome, in skilled hands, is a perfectly clean, straight cut. How can the regularity of the cut be reconciled with this variability of posture and gesture, given that the body alone imparts movement to the blade of the saw? In a now classic study, the Russian neuroscientist Nikolai Bernstein was confronted with an identical paradox. Bernstein observed the gestures of a skilled blacksmith, hitting the iron on the anvil over and over again with a hammer. He found that although the smith consistently brought the hammer down to the exact same spot on the anvil, the trajectories of individual arm joints varied from stroke to stroke. How, he wondered, can the motion of the hammer be so reliably reproduced, when it is only by way of the inconstant arm that the hammer is contrived to move (Latash 1996: 286)? His answer was that the essence of the smith's dexterity lay not in the constancy of his movements, but in the '*tuning of the movements to an emergent task*' (Bernstein 1996: 23, original emphasis). For the novice every stroke is the same, so that the slightest irregularity throws him irretrievably off course. For the accomplished blacksmith or carpenter, by contrast, every stroke is different. The fine-tuning or 'sensory correction' of the craftsman's movement depends, however, on an intimate coupling of perception and action. Thus in sawing, the visual monitoring of the evolving cut, through eyes positioned above to see the wood on either side, continually corrects the alignment of the blade through subtle adjustments of the index finger along the handle of the saw (Figure 4.1, top). Likewise the right hand responds in its oscillations to the sound and feel



of the saw as it bites into the grain. This multisensory coupling establishes the dexterity and control that are the hallmarks of skilled practice.

Dexterity is a necessary accompaniment to what David Pye (1968: 4–5) has called the ‘workmanship of risk’. In such workmanship the quality of the outcome depends at every moment on the care and judgement with which the task proceeds. Thus when working with a saw, as with any other hand-held tool, the result is never a foregone conclusion; rather there is an ever-present danger, throughout the work, that it may go awry. The greatest risk is undoubtedly in the phases of setting out, when the first indelible marks are cut in the edge of the plank, and in finishing off, where careless work could lead to splintering. Of course there are ways to reduce risk, as when the carpenter initially steadies the blade against the joint of the thumb. And the phase of carrying on, during which the groove is well advanced and helps to guide the saw, is much less risky than those of setting out and finishing off. As Pye notes, the workmanship of risk is hardly ever seen in a pure form, but is rather combined in various ways with what he calls the ‘workmanship of certainty’. If, in the workmanship of risk, the result is always in doubt, in the workmanship of certainty it is already predetermined and unalterable from the outset. For example, in my use of the set square to draw a line across the plank, prior to cutting, the trajectory of the pencil point is pre-set by the straight edge of the square. All I have to do is run my pencil along it, which I can do at speed. But just as every craftsman engaged in the workmanship of risk will seek to reduce it through the use of jigs and templates, so conversely, a degree of risk invariably creeps into the most apparently predetermined of operations. Even when the saw is guided by its own groove, maintaining the uniformity of the line calls for continuous attention and correction.

Earlier I compared sawing a plank to going for a walk. As with the walk, the task has a beginning and an ending. Every ending, however, is potentially a new beginning, marking not a terminus but a pause for rest in an otherwise continuous journey. The carpenter, a workman of risk, is like the wayfarer who travels from place to place, sustaining himself both perceptually and materially through a continual engagement with the field of practice, or what I have elsewhere called the ‘taskscape’ (Ingold 2000a: 194–200), that opens up along his path. In this respect he is the complete opposite of the machine operative, a workman of certainty, whose activity is constrained by the parameters of a determining system. Here, ‘the product is made by a planned series of operations, each of which has to be started and stopped by the operative, but with the result of each one predetermined and outside his control’ (Pye 1968: 6). Starting and stopping, as this passage reveals, is not the same as beginning and ending. Between beginning and ending the practitioner’s movements are continually and subtly responsive to the ever-changing conditions of the task as it proceeds. Between starting and stopping, by contrast, he has nothing to do but to leave the system to run its course, according to settings determined in advance. Thus whereas for the craftsman the intervals between ending and beginning again are pauses for rest, for the machine operative those between stopping and restarting are when all the significant action takes place: when plans are laid, instruments reset and materials assembled. Like a traveller who goes everywhere by transport rather than on foot, it is only when he reaches successive destinations that the operative gets down to business. His journey is more like a series of interconnected terminals than a walk. The intimate coupling between movement and perception that governs the work of the craftsman is broken.<sup>1</sup>

Now in any episode of tool use, some gestures are performed just once or a few times, others are repeated over and over again. The former typically occur while getting ready,

setting out and finishing off; the latter during the intermediate phase of carrying on. In our case of sawing a plank, drawing the line, kneeling down, nicking the edge, and shifting the left hand to hold the cut end exemplify the first, while the regular strokes of the saw exemplify the second. When we speak of the activity of sawing, it is usually these *recurrent* movements that we have in mind, rather than the 'one-off' or *occurrent* movements with which they open and close. In this sense, sawing is one of a suite of commonplace tool-assisted activities, including also hammering, pounding and scraping, that all involve the repetition of manual gesture. Indeed this kind of back-and-forth or 'reciprocating' movement comes naturally to the living body. In a fluent performance, it has a rhythmic quality (Leroi-Gourhan 1993: 309–310). This quality does not, however, lie in the repetitiveness of the movement itself. For there to be rhythm, movement must be *felt*. And feeling lies in the coupling of movement and perception that, as we have seen, is the key to skilled practice. As Leroi-Gourhan clearly recognised, technical activity is conducted not against a static background but in a world whose manifold constituents undergo their own particular cycles. By way of perception, the practitioner's rhythmic gestures are attuned to the multiple rhythms of the environment. Thus any task, itself a movement, unfolds within the 'network of movements' in which the existence of every living being, animal or human, is suspended (*ibid.*: 282). An operation like sawing a plank, for example, comprises not one movement but an ensemble of concurrent movements, both within and without the body. The carpenter who has a feel for what he is doing is one who can bring these several movements more or less into phase with one another, so that they resonate or are 'in tune'.<sup>2</sup>

Rhythm, then, is not a movement but a dynamic coupling of movements. Every such coupling is a specific resonance, and the synergy of practitioner, tool and raw material establishes an entire field of such resonances. But this field is not monotonous. For every cycle is set not within fixed parameters but within a framework that is itself suspended in movement, in an environment where nothing is quite the same from moment to moment. As the philosopher Henri Lefebvre argued, in his incomplete and posthumously published *Rhythmanalysis* (2004), there is no rhythm in the mechanical oscillations of a determining system such as a pendulum, which periodically returns to its exact starting point. Likewise the mechanically operated, rotary saw feels nothing, and is wholly unresponsive to what is going on while it cuts. It is precisely because no two strokes are identical that the back-and-forth movement of the handsaw, unlike the spinning of the rotary cutter, is rhythmic rather than metronomic. Rhythmicity, Lefebvre maintained (*ibid.*: 90), implies not just repetition but *differences within repetition*. Or to put it another way, fluent performance is rhythmic only because imperfections in the system call for continual correction. This is why, as ethnoarchaeologist Willeke Wendrich observes in her study of Egyptian basket weaving, which involves techniques that have scarcely changed since pharaonic times, 'working rhythm goes hand in hand with concentration'. Among the contemporary practitioners whose movements she attempted to choreograph, the most skilled were distinguished by a steady working rhythm, intense concentration and a regular appearance of the product. Inexperienced practitioners, by contrast, could not maintain a rhythm; they were easily distracted and their work was irregular in appearance (Wendrich 1999: 390–391). The same, I am sure, applies in the field of carpentry. An arrhythmic and distracted performance with the saw is unlikely to lead to a regular line.

I emphasise this point in order to correct the widespread misapprehension that the training of the body through repetitive exercise – or what Lefebvre (2004: 38–45) calls

*dressage* – leads to a progressive loss of conscious awareness or concentration in the task. The social historian Paul Connerton, for example, remarks that the repetition of certain operations leads to their bodily execution becoming increasingly automatic, to the point that ‘awareness retreats [and] the movement flows involuntarily’ (Connerton 1989: 94). In this view, awareness intervenes only to interrupt the otherwise automatic and involuntary flow of habitual action. I have shown, to the contrary, that the skilled handling of tools is anything but automatic, but is rather rhythmically responsive to ever-changing environmental conditions (see also Ingold 1999: 437). In this responsiveness there lies a form of awareness that does not so much retreat as grow in intensity with the fluency of action. This is not the awareness of a mind that holds itself aloof from the messy, hands-on business of work. It is rather immanent in practical, perceptual activity, reaching out into its surroundings along multiple pathways of sensory participation (Farnell 2000: 409). The retreat of awareness that Connerton takes to be an effect of *enskilment* in fact results from the very opposite process of *deskilling* – that is, from the *dissolution* of the link between perception and action that underwrites the skill of the practitioner. Only in a perfect, determining system can concentration be thus banished from practice, so as to intervene solely in the intervals between stopping and starting. The conjunction of rhythmicity and concentration is, as we have seen, characteristic of the workmanship of risk. It is in the workmanship of certainty – in the operation of a determining system – that concentration lapses, movement becomes automatic and rhythm gives way to mechanism.

### Technology and the end of skill

Throughout history, at least in the western world, the project of technology has been to capture the skills of craftsmen or artisans, and to reconfigure their practice as the application of rational principles whose specification has no regard for human experience and sensibility. ‘At the core of technology’, as philosopher Carl Mitcham succinctly puts it, ‘there seems to be a desire to transform the heuristics of technique into algorithms of practice’ (1978: 252). It is a desire driven by an ideal of mechanical perfection epitomised in the definition of the machine proposed by the engineer-scholar Franz Reuleaux in his classic work of 1876, *The Kinematics of Machinery*: ‘a combination of resistant bodies so arranged that by their means the mechanical forces of nature can be compelled to do work accompanied by certain determinate motions’ (Reuleaux 1876: 35, 503). So far as Reuleaux was concerned, the body of the human operator, insofar as it delivers a purely physical effort, could be considered a ‘force of nature’ like any other, and thus an integral part of what he called the ‘closed kinematic chain’ comprising the machine as a whole (ibid.: 508). Where the artisans of yesteryear had been guided on their way through the taskscape by stories of past use, the operatives of the industrial age seemed – to an engineer like Reuleaux – to be bound to the execution of step-by-step sequences of determinate motions already built into the design and construction of their equipment. In any particular task, then, the flow of action would be broken up into discrete operational steps. Though each operation might differ from the one preceding and the one following, the operation itself would be perfectly monotonous and its repetitive motion – no longer reciprocating but rotary – would be underwritten by sameness rather than difference. Thus the rhythmic pulse of dextrous activity, governed by the coupling of perception and action, would have given way to the metronomic oscillations of mechanically determining systems.

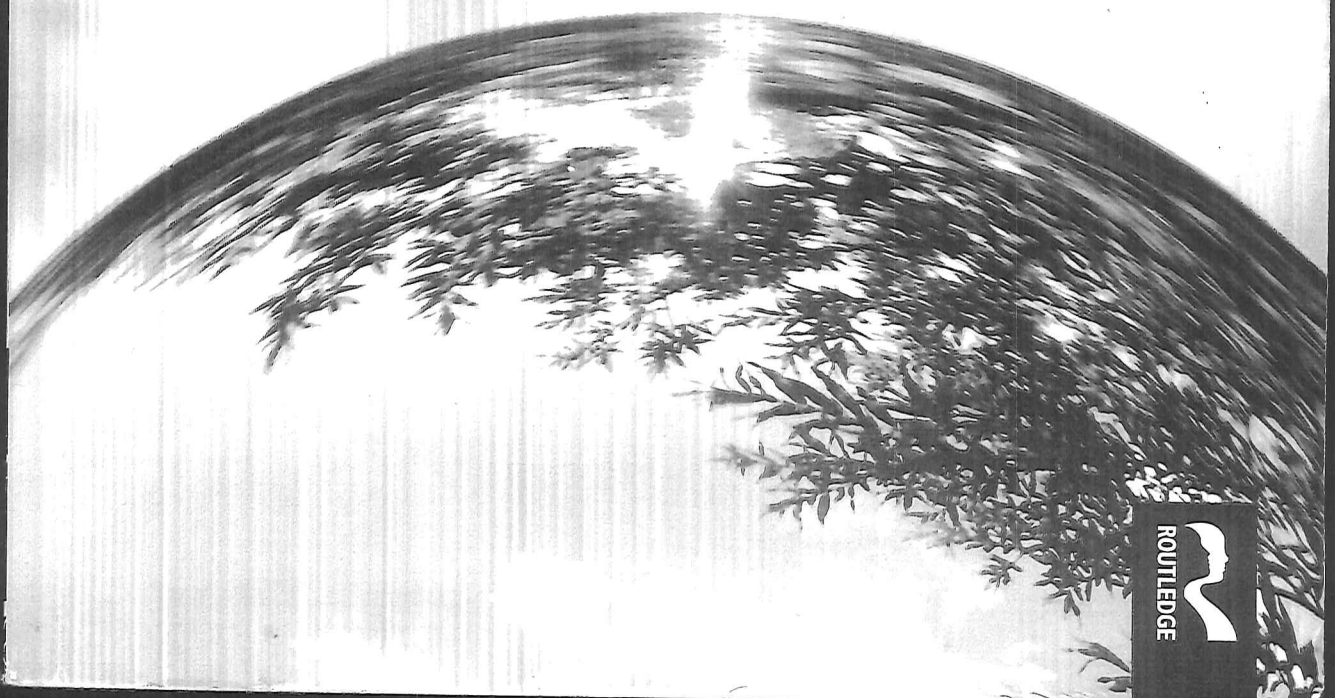
As inhabitants of modern industrial societies, contemporary practitioners find themselves in an environment where the technological project appears to have triumphed, sweeping all else before it. Has this, then, spelled the end of skill? Was American socialist Harry Braverman right to foresee that the increasing mechanisation of industry, driven by the inexorable demands of monopoly capitalism, would inevitably lead to the deskilling of the workforce or – which amounts to the same thing – an impoverished conception of skill (Braverman 1974: 443–444)? I believe the prognosis to be premature, for two reasons. First, no machine can be perfect. Let me return for a moment to my earlier comparisons between the handsaw and the rotary cutter, and between the arm of the carpenter and the pendulum. In order to establish the distinction between rhythmic and metronomic oscillation, I overstated the contrast. In the real world, mechanical contrivances are sensitive to environmental perturbations, just as people are. Even the most finely tuned circular saw, for example, is susceptible to irregularities and imperfections in the wood, while a pendulum may respond in its swing to the contours of the surface on which it is mounted, as well as to air pressure, heat and humidity. Even the metronome may not be truly metronomic. Indeed the philosopher Gilbert Simondon has gone so far as to claim that the perfection of the machine lies in precisely this: that the apparent closure of the kinematic chain conceals a margin of indeterminacy. 'A purely automatic machine closed in on itself in a predetermined operation could only give summary results', says Simondon. 'The machine with superior technicality is an open machine ...' (Simondon 1980: 4). And the human practitioner, surrounded by such machines, is *among* them, working with machines that work with him.

Not only, then, are machines open rather than closed, but also the project of technology chases a target that recedes as fast as it is approached. Here lies the second reason why technological advance does not inevitably augur the end of skill. 'The entire history of technics', argues historian François Sigaut, 'might be interpreted as a constantly renewed attempt to build skills into machines by means of algorithms, an attempt constantly foiled because other skills always tend to develop around the new machines' (Sigaut 1994: 446). So generally is this the case that Sigaut feels justified in referring to the 'law of the irreducibility of skills'. To rephrase the law in our terms: at the same time that narratives of use are converted by technology into algorithmic structures, these structures are themselves put to use within the ongoing activities of inhabitants, and through the stories of this use they are reincorporated into the field of effective action within which all life is lived. The essence of skill, then, comes to lie in the improvisational ability with which practitioners are able to disassemble the constructions of technology, and creatively to reincorporate the pieces into their own walks of life. In this ability lies life's power to resist the impositions of regimes of command and control that seek to reduce practitioners to what Karl Marx (1930: 451) once called the 'living appendages' of lifeless mechanism. Thus skill is destined to carry on for as long as life does, along a line of resistance, forever undoing the closures and finalities that mechanisation throws in its path.

TIM INGOLD

BEING ALIVE

ESSAYS ON MOVEMENT,  
KNOWLEDGE AND DESCRIPTION



ROUTLEDGE

