

one with the performer. Experts do not see problems as one thing and solutions as something else; they do not get anxious about the future while they act; they do not make plans. Their skills have become so much a part of themselves that they are no more aware of them than they are of their own bodies.

It is important to emphasize that when Dreyfus and Dreyfus use the word "intuition" they do not mean some kind of guesswork, irrationality, or supernatural inspiration, as the cognitivists often describe it, usually as a preface to a critique. For Dreyfus and Dreyfus intuition is a property which each individual uses in everyday life. The cognitivists, limited as they are to explanations in terms of rule-based processes, can explain only *competent* human performance. They are so far unable to integrate humans' *expert* performances into their models. Take something as mundane as riding a bicycle. Someone able to ride a bike has not formulated a set of rules, which, if followed, can teach somebody else to ride a bicycle. How could we, for example, "teach" the difference between nearly falling and the need to lean over in order to turn a corner? How do we explain the best response to being off balance? Bicyclists can bicycle because they have the necessary know-how, achieved via practical experiences, invariably accompanied by a few childhood scrapes and bruises. Experience cannot necessarily be verbalized, intellectualized, and made into rules. Therefore, the cognitivists have a difficult time understanding it.

Sitting at a computer, a virtuoso secretary "is one" with the machine and does not think over what finger does what on the keyboard. A virtuoso car driver is one with the car. If an American attempts to drive in a left-hand-drive country such as England, however, the experience is one of stepping backwards in the learning process: formerly effortless, unreflected driving becomes stiff and dependent on the conscious deliberations and decisions of the beginner. It becomes a problem to make a right turn or to drive through a rotary. The same happens to hospital doctors who transfer to a new unfamiliar ward. Hence, there exist rotation arrangements as part of training young doctors. Studies of pilots' learning processes indicate that novice pilots "fly their planes," while as experienced pilots "they fly." The separation between person and machine, subject and object disappears.

One scientific domain, which puts virtuoso expertise into sharp and instructive contrast with rational competence, is the area of "artificial intelligence" and "expert systems." The field so far has been strongly procedural and rule-bound because both artificial intelligence and expert systems must be programmed.<sup>15</sup> When designers of expert systems seek to replicate in their systems the decisions of professionals such as doctors, geologists, chemists, pharmacologists, and stockbrokers, these

professionals have a difficult time explaining to the system designers what they are doing in terms of specific procedures and rules. Donald Schön has described the problem: "When [the professional practitioner] tries, on rare occasions, to say what he knows – when he tries to put his knowing into the form of knowledge – his formulations of principles, theories, maxims, and rules of thumb are often incongruent with the understanding and know-how implicit in his pattern of practice."<sup>16</sup>

• The Dreyfus model enables us to understand why: virtuosos simply do not use rules. They recognize thousands of cases directly, holistically, and intuitively on the basis of their experience. In the preface to the revised paperback edition of their *Mind over Machine*, on the basis of experience from neural networks, Dreyfus and Dreyfus downgrade the importance of storing memories and recognizing similarities. Instead, because of her or his experience, "the expert holistically *discriminates* among classes of situations and *associates* with these classes appropriate responses" (emphasis in original).<sup>17</sup> The rules for expert systems are formulated only because the systems demand it. They are characteristics of the systems, but not of the real experts. Research shows that heuristic expert systems, being rule-based, are unable to go further than level three in the learning process. The heuristic systems cannot make the qualitative jump to levels four and five and therefore never become as skillful as human experts. This conclusion also applies when the systems are compared with the behavior of the same experts who gave the rules to the system builders. In this sense, the term "expert systems" is a misnomer. In terms of the Dreyfus model they are no more than "competent systems." Only in areas which are context-independent, which can be strictly separated from daily understanding and from change, and which have well-defined problems with clear rules for their solution, only in these rare areas, and in tasks where brute computational number crunching can solve problems, will expert systems succeed as well or better than human experts. Tests of existing expert systems support this conclusion.

### Rationality, irrationality, arationality

The five levels in the learning process can be briefly summarized as follows.

- (1) Novices act on the basis of context-independent elements and rules.
- (2) Advanced beginners also use situational elements, which they have learned to identify and interpret on the basis of their own experience from similar situations.
- (3) Competent performers are characterized by the involved choice of

eg in engineering, physics,  
 weather predictions, etc.  
 And not that experts fail.  
 contexts change. Eg a  
 computer can diagnose  
 diseases better than most  
 professors & some expert  
 diagnosticians.

goals and plans as a basis for their actions. Goals and plans are used to structure and store masses of both context-dependent and context-independent information.

- (4) Proficient performers identify problems, goals, and plans intuitively from their own experientially based perspective. Intuitive choice is checked by analytical evaluation prior to action.
- (5) Finally, experts' behavior is intuitive, holistic, and synchronic, understood in the way that a given situation releases a picture of problem, goal, plan, decision, and action in one instant and with no division into phases. This is the level of true human expertise. Experts are characterized by a flowing, effortless performance, unhindered by analytical deliberations.

The Dreyfus model contains a qualitative jump from the three first to the fourth and fifth levels. The jump implies an abandonment of rule-based thinking as the most important basis for action, and its replacement by context and intuition. Logically based action is replaced by experientially based action.

Dreyfus and Dreyfus provide several conceptual and empirical examples to illustrate the validity of their model. They also describe how the results of recent research in human learning fit with it. They conclude that intelligent action consists of something other than calculated, analytical rationality, even though we often hear the opposite. From the perspective of the Dreyfus model, analytical rationality is a limited rationality: it is appropriate to the lower levels in the performance of a skill, but not to high-level performance.

The best performances within a given area require a qualitatively different expertise based on intuition, experience, and judgment. As yet, there exist no computer programs which have succeeded in capturing and simulating this expertise. Intuition is the ability to draw directly on one's own experience – bodily, emotional, intellectual – and to recognize similarities between these experiences and new situations. Intuition is internalized; it is part of the individual. Existing research provides no evidence that intuition and judgment can be externalized into rules and explanations, which, if followed, lead to the same result as intuitive behavior. Such externalization is possible only for analytical rationality, that is, for those skills which characterize the lower levels in the learning process.

That conventional rationality is not the ultimate outcome of human learning processes does not mean, however, that one necessarily ends in irrationality. Research in learning processes indicates that the conventional opposition between rationality and irrationality is inadequate for an

But in creating  
new knowledge it  
is essential!

understanding of what actually happens when individuals understand and act. In order to bridge this gap, Dreyfus and Dreyfus invoke the concept "arational." The word "rational," from the Latin *ratio*, means to calculate or reason. Rationality in the West has become identical with analytical thinking, that is, with conscious separation of wholes into parts.

- Arational behavior, in contrast, connotes situational behavior without the conscious analytical division of situations into parts and evaluation according to context-independent rules. Dreyfus and Dreyfus link increasing levels of skill acquisition with a relatively declining level of analytical rationality: "competent performance is rational; proficiency is transitional; experts act arationally."<sup>18</sup> In the present context, the interesting point is that the Dreyfus model and "arationality" accord a central importance to context in the development of knowledge and skills. As will be shown in the next chapter, this has radical implications for social science.

The Dreyfus model can be criticized for being slightly mechanistic and insensitive to issues of creativity, innovation, and power.<sup>19</sup> However, such weaknesses do not detract from our use of the model in the current context. The argument in the following chapters is based on only a single property of the model, and this property is convincingly established in its original form; namely, the qualitative jump from the model's first three stages to the two last stages, that is, from rule-based, context-independent to experience-based, situational behavior. Other properties of the model are irrelevant for our purposes.

On closer examination, the qualitative difference between rule-based and experience-based behavior shows itself to have radical consequences, in that every rule-based, rational mode of conceiving of human activity – be this activity scientific, practical, or didactic – collapses when confronted with the Dreyfus phenomenology. This is the model's critical and deconstructive perspective, a perspective which caused Jürgen Habermas, after having heard Hubert Dreyfus present the model to him at Frankfurt University, to exclaim, "you are talking about skills like hammering and playing chess, but what you really want to do is undermine Western society." To which Dreyfus replied, "you are right, that's exactly what it comes to."<sup>20</sup>

The Dreyfus model shows how the rational mode of thinking is inadequate for comprehending the total spectrum of human activity, both in relation to human everyday activities and to rare virtuoso performances. Instead, the rationalist perspective focuses on those properties of human activity by which humans most resemble machines or Weberian bureaucrats: rule-based deliberation based on formal logic.

The Dreyfus model has not only critical implications, however. Its additional value – which in this context is more important + is constructive.

notice that the model itself is "rational" - divides a continuous experience into discrete linear steps!

The model makes clear that what we could call the "rational fallacy" does not lie in the rationalists' emphasis on analysis and rationality as important phenomena. These *are* important, also according to the Dreyfus model. Rather, the rational fallacy consists of raising analysis and rationality into the most important mode of operation for human activity, and allowing these to dominate our view of human activity: so much so that other equally important modes of human understanding and behavior are made invisible. The Dreyfus model does not present a situation of "either rationality or intuition" but of both of them in their proper context: the position of intuition is not beyond rationality but alongside it, complementary to it, and insofar as we speak of experts, above rationality. The model specifies that what is needed in order to transcend the insufficient rational perspective is explicit integration of those properties characteristic of the higher levels in the learning process which can supplement and take over from analysis and rationality. These properties include context, judgment, practice, trial and error, experience, common sense, intuition, and bodily sensation.

### **Context, experience, and intuition**

In the introduction to this chapter I described a study in which a group of paramedics had been asked, "who would you choose to revive you if you had been victim of an accident?" The experienced paramedics, that is, the practitioners, knew what was good for them and chose the experienced rescuer even though this individual appeared in only one of the six video films shown. Practical experience consists precisely in an individual's ability to readily recognize skill and virtuoso expertise. Teachers in rescuing life were especially unable to identify the expert paramedic, they were even worse than the group of inexperienced trainees.

After the review of the Dreyfus model we can understand why. The teachers attempted to identify a competent rescuer by looking for individuals who best followed the rules the teachers themselves had taught their students in CPR. The teachers' concept of "good" resuscitation technique was simply to follow the rules. They tended to identify the inexperienced students on the films as "good" because, as novices, they closely and consciously followed the rules they had learned. Being novices, the students could do little else. In 70 percent of the cases the teachers could not identify the experienced rescuer because this individual, being truly experienced – an expert – had gone beyond rule-based behavior.

The example would be trivial if the problem of the dominance of rule-based rationality over practical experience pertained only to teaching in the health sector or only in the United States. Regrettably, the pervasiveness of the rational paradigm to the near exclusion of others is

problem for the vast majority of professional education, and especially in practical fields such as engineering, policy analysis, management, planning, and organization. All are professions where practical skill occupies central importance but has been threatened by epistemic science and didactics. Law is an exception. The practice of law cannot be decontextualized to the same degree as other disciplines and has therefore never been made "scientific" to the same extent.

As for the teachers in heart-lung resuscitation, the rule-based, rational mode of thinking generally constitutes an obstacle to good results, not because rules and rationality are problematic in themselves, but because the rational perspective has been elevated from being necessary to being sufficient, even exclusive. This has caused people and entire scholarly disciplines to become blind to context, experience, and intuition, even though these phenomena and ways of being are at least as important and necessary for good results as are analysis, rationality, and rules. In part, this is the problem Nietzsche points to when he stresses that "the growth of consciousness becomes a danger"; the faculty of consciousness may marginalize those faculties making true human expertise possible.<sup>21</sup> It is also one reason that Nietzsche is highly critical of central tenets in the thought of Socrates who regarded explicit rational understanding as the highest human accomplishment. "Socrates was a misunderstanding," Nietzsche writes, "rationality at any cost . . . in opposition to the instincts, has itself been no more than a form of sickness."<sup>22</sup> As an antidote to Socrates, Nietzsche suggests that the central task for human beings is not the Socratic one of making knowledge cerebral and rational but instead one of making it bodily and intuitive. In Nietzsche's own words what is central is "the task of *incorporating* knowledge and making it instinctive," a task Nietzsche regrets "is only beginning to dawn on the human eye and is not yet clearly discernible"<sup>23</sup> (emphasis in original). The Dreyfus model helps make this task clear.

The conclusion that rationality may endanger sensitivity to context, experience, and intuition is important for teaching, and teaching can be directly compared with the model for human learning. However, the conclusion also applies to scientific research, even though it demands a more complex argumentation. In the following two chapters, I will deal with the implications of arationality to social science, using the conclusions from this chapter to evaluate social science theory and methodology. We will see a whole gamut of key scientific notions collapses when subjected to the model's critical perspective. Then the constructive perspective creates the point of departure for the development of an alternative concept of social science, one based on context, judgment, and practical knowledge.