

# Using Your Head



Prof. Edward Necka  
researches the psychology  
of human intelligence

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**Intelligence theory encompasses different approaches to human intelligence and distinguishes between at least two forms of consciousness.**

**The problem is: how does intelligence in its variety relate to human consciousness?**

Saying what intelligence is *not* is easier than identifying what it actually is. Intelligence is not the same thing as knowledge, although acquiring knowledge may require intelligence, and acquired knowledge might be put to more or less intelligent use. Moreover, intelligence cannot be simply equated with specific abilities (such as mathematical talent), proficiencies (manual dexterity) or skills (playing chess). Neither can it be equated with experience, although learning something new does require intelligence and may involve a feedback effect, raising one's level of intelligence.

## **So what is intelligence?**

Modern definitions stress that it represents a general ability to effectively cope with new or complex problems – a topic I discuss in more detail in my book *Inteligencja: Geneza – struktura – funkcje (Intelligence: Genesis – Structure – Functions)*. Because of the general nature of this ability, it manifests itself in a wide range of situations, meaning that it cannot be reduced to a narrow cognitive competence. Insufficient intelligence should, therefore, impair human function in many fields and with respect to many cognitive tasks, while a deficiency in specialized skills will only have a negative impact on a narrowly defined category of tasks (such as mathematical ones). Intelligence viewed in such terms is chiefly evident in new situations, when one is unable to apply fixed models of action or pre-

viously developed skills. Problems involving a small degree of novelty may offer an opportunity for intelligence to manifest itself, but they do not require it; wholly new problems, on the other hand, can only be solved with a considerable dose of intelligence. Similar arguments hold with respect to the second criteria of intelligence, namely complexity. Simply-structured problems containing little data and few unknowns do allow for the use of intelligence, but do not require it. Only problems with a high degree of complexity present a good measure of the intelligence of the individual solving them.

The primary problem in modern intelligence research is how to reconcile the structural and the processual approaches to the phenomenon. As an ability, intelligence is something relatively stable: although it can be affected by developmental and degenerative changes, it entails a lasting disposition to cope with new or complex problems. On the other hand, this disposition rests upon problem-solving cognitive processes, chiefly the process of thought. Processes are, by their very nature, transitory and impermanent. This means that intelligence demonstrates both structural and processual characteristics. Due to the dual nature of the phenomenon, studies researching human abilities are frequently carried out in isolation from research on mental processes, and vice versa.

## **A pitfall in intelligence tests**

Another problem lies in the duality of intelligence, understood to be a permanent disposition yet at the same time a transitory state of the mind. It is not the case, after all, that an intelligent individual always manifests his or her intelligence, in every situation. There is a constant fluctuation of intellectual proficiency, as a result of which each of us generally functions below our maximum limits. Herein lies a pitfall for those who author and administer intelligence tests: participant in such tests mobilize their resources, focus their attention, and benefit from motivational mechanisms, and so there-

fore perform better during such tests than they do in "real life."

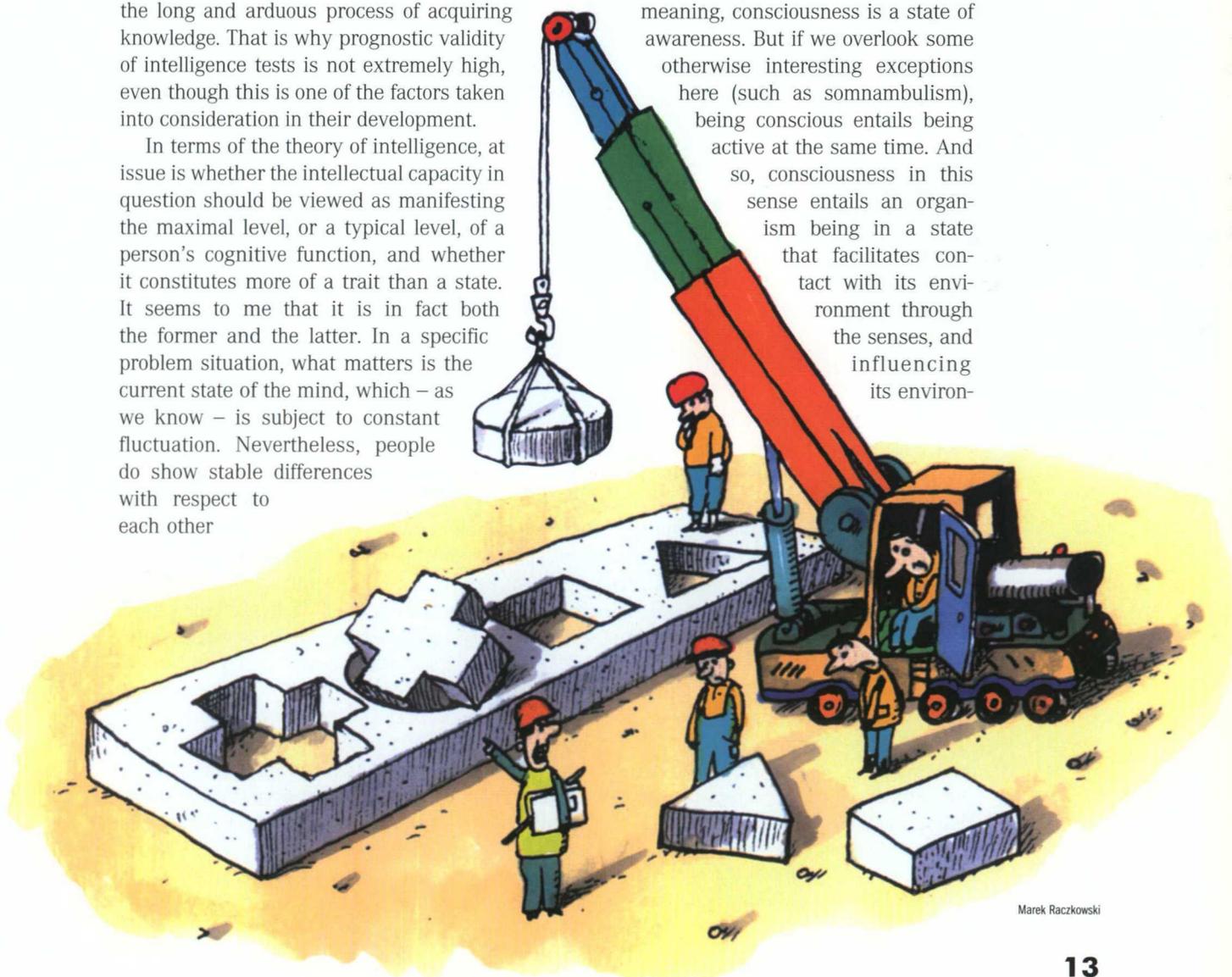
Stress and the specific demands of the "test" situation do tend to bring performance down from optimal, but even so test results reflect the typical level of an individual's intellectual capacity only to a small degree. What they do evidence is more an atypical level, one achieved through an extraordinary mobilization of the participant's cognitive and motivational resources. Yet what we expect such tests to tell us is how the participant will react in situations that are more typical than extraordinary. For example, a school pupil's grades depend on his or her typical mental capacity, as observed over the course of an entire school year, in many classes. Heightened mobilization during exams or tests can only improve such results to a small degree, if such mobilization was absent during the long and arduous process of acquiring knowledge. That is why prognostic validity of intelligence tests is not extremely high, even though this is one of the factors taken into consideration in their development.

In terms of the theory of intelligence, at issue is whether the intellectual capacity in question should be viewed as manifesting the maximal level, or a typical level, of a person's cognitive function, and whether it constitutes more of a trait than a state. It seems to me that it is in fact both the former and the latter. In a specific problem situation, what matters is the current state of the mind, which – as we know – is subject to constant fluctuation. Nevertheless, people do show stable differences with respect to each other

in terms of how likely certain mental states are for them. We say of certain individuals that they are intelligent, because despite such great fluctuations it is highly likely that when a new or complex problem present itself, they will be able to cope effectively. We say of others that they are less intelligent, because this likelihood is lower in their case. And so, intelligence can be defined as the stable disposition of an individual to frequently display the mental state necessary for coping with new or complex situations – and this is the theoretical stance taken in my work *Pobudzenie intelektu: Zarys formalnej teorii inteligencji* (*Arousal the Intellect: Outline of a Formal Theory of Intelligence*).

### What is consciousness?

Consciousness is something even more difficult to pin down. In its most basic meaning, consciousness is a state of awareness. But if we overlook some otherwise interesting exceptions here (such as somnambulism), being conscious entails being active at the same time. And so, consciousness in this sense entails an organism being in a state that facilitates contact with its environment through the senses, and influencing its environ-

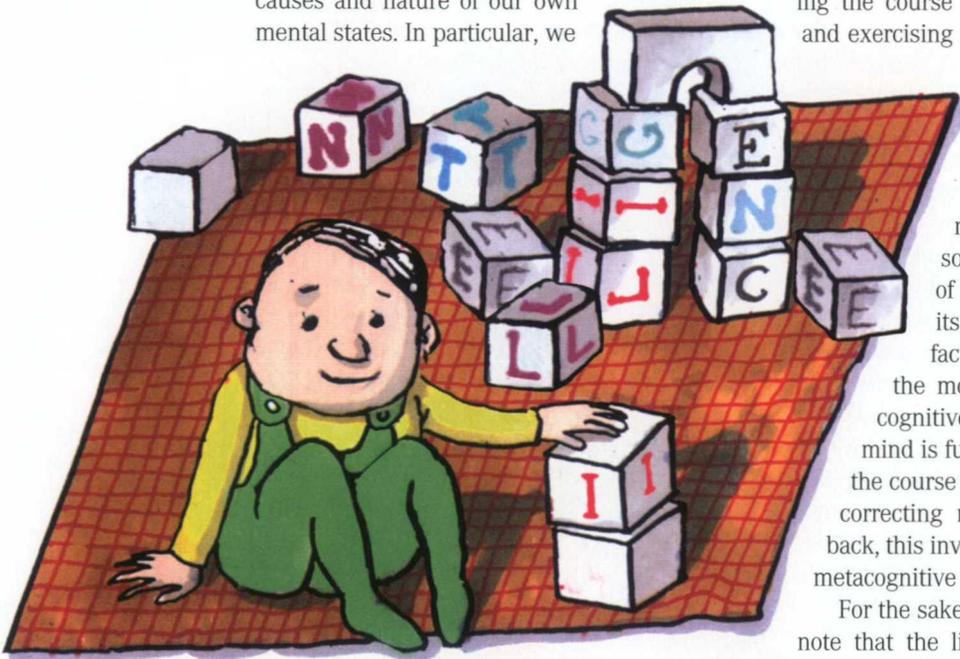


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## Conscious and unconscious intelligence

ment through effectors. An aware organism is characterized by what is called extraspective consciousness, which involves realizing what it is that we see, hear, or otherwise perceive in the environment via our senses.

Another type of consciousness, called introspective, involves having access to one's own mental processes. For example, when a person sees an object and is at the same time aware that he or she sees it, or when someone feels anger or sadness, and at the same time knows what he or she is feeling. Sometimes we can also possess knowledge about the causes and nature of our own mental states. In particular, we



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might be familiar with certain aspects of our own cognitive processes, such as perceiving, remembering, or thinking. If we not only remember something but are also aware of the extent of our own memory (or lack thereof), we can talk about the occurrence of metacognitive awareness. This is especially appropriate when, as a result of conscious and intentional processes, we are capable of sensibly managing our own memory resources, such as refreshing them by using them, or if necessary purposefully ignoring them. Yet metacognition pertains to all human intellectual processes, not just memory. For example, our attention may be directed automatically (e.g. attracted by a sudden loud noise) or as a result of autonomous control actions, when we consciously and purposefully concentrate our attention on something interesting or par-

ticularly important to us. Thought might take on the form of an unreflective problem-solving process, or it might involve following a specific plan, harnessing knowledge about effective strategies and intellectual operations, or drawing upon the rules of correct reasoning.

It is difficult to draw a clear-cut distinction between introspective consciousness and metacognition. The former is usually assumed to involve an awareness of the very existence of a certain mental state or process (i.e. the fact that I see a yellow leaf, or that I am angry), while the latter involves monitoring the course of other mental processes and exercising effective control over them.

Insofar as the mind only "knows" that it is thinking about something or recalling something, this is introspective consciousness. But if it also "knows" something about the course of this process, its stages, and its mitigating and hampering factors, we can then speak of the monitoring function of metacognitive consciousness. And if the mind is furthermore able to influence the course of this process, for example correcting mistakes or utilizing feedback, this involves the control function of metacognitive consciousness.

For the sake of completeness, I will also note that the literature mentions at least two more ways of understanding the term "consciousness."

### Self-awareness

One of them is the concept of consciousness as a subjective state. This refers to the individual's way of experiencing internal mental states, by definition inaccessible to other people. For example, I may realize that I see a yellow leaf, and I can communicate this perception to other people. Yet I am unable to communicate the whole complex of sensations associated with my perception of the leaf. A completely different notion involves the awareness of "self," meaning the capacity to distinguish knowledge about oneself, about one's own traits and experiences, from other elements of knowledge. People, and presumably many species of animals, have the capacity to distinguish between those aspects of our

awareness that derive from our own actions (physical or intellectual), and what stems from events independent of us. An inability to draw such distinctions can give rise to characteristic disorders, involving for example succumbing to uncontrolled thoughts or failing to distinguish fact from fiction.

### Conscious intelligence?

Intelligence does not have to be conscious, but such intelligence is presumably then not particularly outstanding. Consciousness, in turn, does not have to be intelligent, but it then corresponds more to what we call awareness, less to metacognition. This is why one typical manifestation of intelligent mental states involves the employment of various forms of consciousness, particularly metacognitive consciousness. And so, we can risk positing that the more metacognition there is, the greater the intelligence – this holds for the kind of intelligence that is a permanent disposition, and for the kind that is a transitory state of mind. Through metacognitive awareness, we gain power over our own mind and its actions, which manifests itself in our monitoring the course of mental processes, regulating them (correction, reacting to errors), or guiding their progress. The very awareness of what we know and what we don't know increases our intelligence, in line with one well-known statesman's observation that "known unknowns" are better than "unknown unknowns." Our insight into our own cognitive processes is undoubtedly limited and imperfect, but this is exactly why we cherish it. If everyone always had excellent control over their own minds, mankind would be considerably more intelligent, and interpersonal differences in terms of intelligence – insofar as they still existed – would presumably stem from other sources. Yet because our metacognition is incomplete and imperfect, every metacognitive act immediately translates into higher, more refined intelligence. Precious metals are valuable because they are rarely found in nature. In the procesural model of intelligence, presented in more detail in the book *Arousal the Intellect: Outline of a Formal Theory of Intelligence*, the capacity for the metacognitive regulation of one's own mental states is considered to be one of the important sources of human intelligence.

There are, however, interesting exceptions to this general rule. Certain human mental

processes do take place with marginal metacognitive awareness, but despite this we do not hesitate to call them intelligent. These are certain manifestations of intuition. For example, people are able to learn a complicated rule and employ it successfully even without being aware of what sort of rule this is. An excellent case in point here is linguistic intuition: using the rules of grammar, which are abstract and quite complex, does not require them to be verbalized. Someone who does not know how many rules there are for forming plurals in English, or how many exceptions there are to these rules, is of course still able to communicate using the proper grammatical forms. People are also able to learn quite com-

Thanks to intuition people are able to learn a complicated rule and employ it successfully even without being aware of what sort of rule this is

plex rules, such as those invented by experimental psychologists. A very large number of experiments have shown that participants can correctly characterize objects according to rules unknown to them, correctly distinguish between sequences of letters based on certain patterns, and even control complex systems that function according to certain rules (such as a production plant simulation), even though they have no idea of what it is that they are controlling. Experiments of this sort have been carried out at the Institute of Psychology at Jagiellonian University, including by Dr. Robert Balas and Dr. Michał Wierzchoń.

The human mind's scrutiny of its own functions and capabilities makes for a fascinating intellectual enterprise. And although it is naturally hard to say where such inquiry will take us, one thing seems certain: the achievements of successive generations of researchers will continue to expand our knowledge about the role various forms of consciousness, especially metacognitive consciousness, play in our intellectual activity. ■

#### Further reading

- Balas, R., Wierzchoń, M. (2002). Can abstract rules be learned unconsciously? [in Polish]. *Studia Psychologiczne*, v. XL, p. 5-19.
- Necka, E. (2002). *Arousal the Intellect: Outline of a Formal Theory of Intelligence* [in Polish]. Kraków: TAIWP Universitas.