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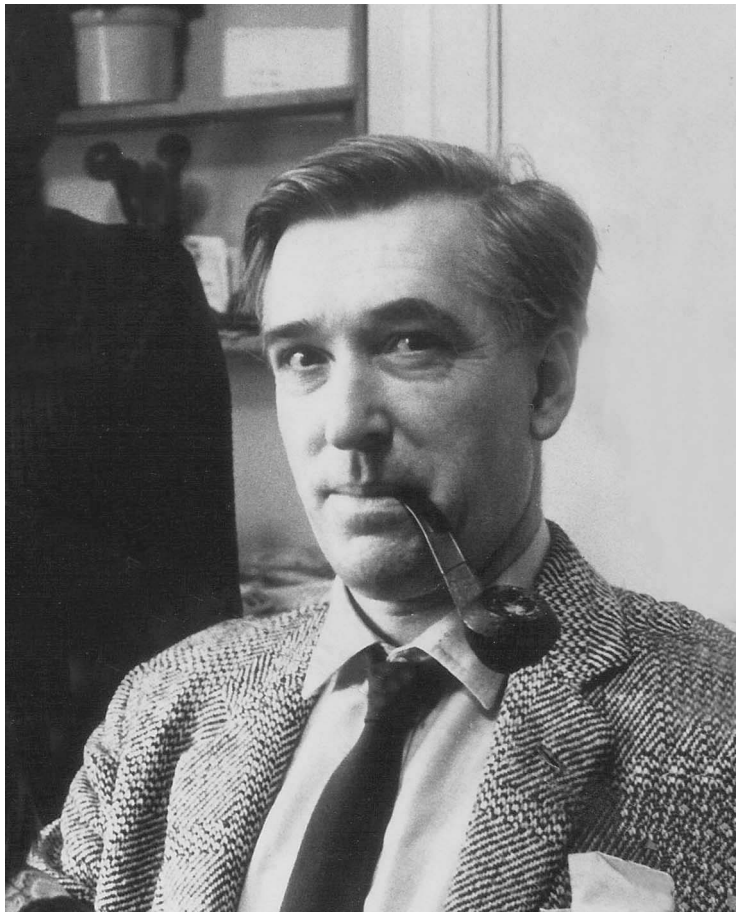
Editorial obituary

Peter Wason (1924–2003)



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Peter Wason died peacefully on 22nd April, 2003, a few days short of his 79th birthday. He was one of the founders of the modern study of thinking and reasoning: Without his research, this journal is unlikely to have existed. He wrote a brief intellectual autobiography, which revealed a childhood marked by repeated failure of examinations (Wason, 1995). Yet, he passed through officer training at Sandhurst and served as a liaison officer in Normandy during World War II. He was invalided out with severe injuries in 1945. On his recovery, he read English at New College, Oxford, and became a lecturer at Aberdeen University. He found teaching English unsatisfying, and so he took an undergraduate degree in Psychology in 1953 at University College London. He was to stay at UCL for the rest of his academic career, until his retirement in the early 1980s. His most senior appointment was Reader in Psycholinguistics.

Wason believed strongly in running experiments himself, and in observing first hand the behaviour of his subjects. He did not test subjects in groups, only occasionally employed research assistants, and never used a computer to present an experimental task. (He was astonished to learn later in his career that his selection task was being presented on computer screens by some researchers. "How are the subjects able to turn over the cards?" he asked. "Don't they get very frustrated?"). He regarded statistical analysis as at best a necessary evil; and an element of clinical observation was present in most of his experiments. He interacted with his subjects, and recorded what they had to say about their performance. His reports of these interactions gave his papers a different character from most other psychological publications at that time. He also believed that psychologists should never quite know *why* they were carrying out an experiment. The purpose of his experiments was not usually to test a hypothesis or theory, but rather to explore the nature of thinking. His aim was to reveal a surprising phenomenon—to show that thinking was not what psychologists including himself had taken it to be. His research strategy was to rely on his unconscious, or preconscious, mind. He wrote of this strategy: "The distinctive criterion is one of passivity and the absence of intellectual effort" (Wason, 1995).

Wason's research career started in the MRC Industrial Psychology Research Group at University College London. Here, he began a long-term collaboration with Sheila Jones, who was a permanent member of his later post-graduate seminar. His first paper was about women employed in a perfume factory to wrap soap (Wason, 1954). As they wrapped, they did a jig. That is, they danced around in a convulsive way, which was disconcerting to watch, and which worried the managers. He allayed their worries. He showed that the more the women jigged, the more soap they wrapped (contrary to time-and-motion study).

Wason also began his work on negation at the MRC unit. His first paper reported a study in which the subjects had to complete affirmative and negative sentences about simple perceptual arrays (Wason, 1959). They completed the affirmatives faster than the negatives, e.g., "there is not both yellow in square 4 and red in square 3". Whether negative or affirmative, they completed sentences

to agree with the array faster than to conflict with it. A subsequent and better-controlled study corroborated this result using the completion of statements about numbers, e.g., "__ is not an odd number" (Wason, 1961). Those subjects who could report on their performance invariably said that they had used a technique "in which negative statements were reduced to affirmative terms, either by ignoring 'not' and inverting the implicit response … or by reading 'not odd' as 'even' ". The most striking result occurred in a study with Sheila Jones. When subjects evaluated numerical statements as true or false, there was a reliable interaction (Wason & Jones, 1963). They evaluated affirmative assertions faster as true than as false, but they evaluated negative assertions faster as false than true. The interaction led him to make the seemingly paradoxical assertion: in real life, negatives are false. What he meant was that negatives are normally used in everyday discourse to correct misconceptions, e.g., "Mr. Heath is not dead".

In an experiment carried out by Susan Carey during his year in 1963 at the Harvard Center for Cognitive Studies, Wason showed that context affected performance. Individuals were faster to complete a negative sentence correcting a likely misconception, e.g., "Circle No. 7 is *not* red" in a context in which the remaining circles were red (Wason, 1965). These phenomena of negation had an impact on the developing field of psycholinguistics (see George Miller's, 2003, comment on Wason's influence). They showed that comprehension was more than dealing with transformations in syntax. Semantics mattered; pragmatics mattered.

Sir Karl Popper (1959) had argued that falsifiability was the criterion that distinguished between scientific and non-scientific hypotheses. But, do people try to falsify their hypotheses? Bruner, Goodwin, and Austin (1956) had examined the acquisition of new concepts in the laboratory, and they had remarked that their subjects often made redundant confirming checks of their hypotheses (p. 93). Wason developed a novel task that was closer in spirit to the scientific testing of a hypothesis (Wason, 1960). He told his subjects that the sequence 2, 4, 6, conformed to a simple rule, which they had to discover by generating successive triples of numbers of their own. They also wrote down their reasons for choosing to test each triple. After each triple, the experimenter told them whether or not it conformed to the rule, which was "numbers in increasing order of magnitude". When the subjects were highly confident that they were correct, they could announce their hypothesis about the rule. The actual rule, of course, can never be confirmed, but any false hypothesis about it can be refuted. The task revealed two important phenomena. First, the triples that the subjects choose were positive instances of the reasons that they gave for choosing them. That is, they seemed to be seeking to confirm their hypotheses rather than to disconfirm them. Second, they would often go on seeking such confirmations ad nauseam. They were fixated on an incorrect hypothesis and unable to refute it, because in Bruner et al.'s terms they had a "thirst for confirming redundancy".

Much of Wason's work became controversial, because it apparently showed people as illogical or irrational. The 2-4-6 task was the first case. It was attacked almost immediately on the grounds that the subjects were tricked and misled by the task (Wetherick, 1962). As others pointed out, the selection of a positive instance of a hypothesis to test is not necessarily motivated by the intention of *confirming* the hypothesis (Klayman & Ha, 1987). Wason himself (1968) felt misunderstood: "Unlike most concept attainment tasks, the point was not to see whether the subjects discovered the rule. The point was to see how they behaved when their hypotheses had been corroborated by confirming evidence" (p.165). What their behaviour showed was indubitable signs of irrationality. For example, in a later study, subjects who announced an incorrect hypothesis were asked: "if you were wrong, how could you find out?" The majority replied that they would continue to generate positive instances of their hypothesis (Wason, 1968).

Wason's reports on the 2-4-6 task included many of the subjects' retrospective reports. He was fascinated by the way in which his subjects would reformulate a rule in different words rather than give it up. For example, on being told that the following rule was wrong: *The rule is that the difference between two numbers next to each other is the same*, a subject offered as an "alternative": *The rule is adding a number, always the same, to form the next number.* Wason's discussion of this phenomenon anticipates the development of dual process theories of reasoning (see below). To get a flavour of the observational aspect of his writings, consider the following quotation (Wason, 1968, p.173):

> … subjects, who had announced incorrect rules, were surprised and amused by what they recognised as their own stupidity, but they claimed the experience, far from being humiliating, was both instructive and even cathartic. On the other hand, those subjects who announced the correct rule without announcement of incorrect ones, adopted an air of bland condescension and could not see any point in the experiment.

The most famous of Wason's experimental paradigms is the selection task. He developed it as a result of musing about Quine's account of the truth table for material implication. The experimenter puts four cards down on the table in front of you, bearing respectively: A, D, 4, 7. You know that every card has a letter on one side and a number on the other side. Your task is to choose just those cards that need to be turned over to determine whether the following conditional rule is true or false about the four cards: *If a card has a vowel on one side then it has an even number on the other side*. The cards are to be turned over simultaneously, so that what is on the other side of a card has no bearing on the selection of another card. Nearly everyone selects the A card, and some in addition select the 4 card. What is surprising is how few people select the 7 card. Yet if it has an A on its other side, the rule is false. The robustness of this finding was demonstrated in repeated attempts to dispel the participants' oversight (see the papers summarised in Wason & Johnson-Laird, 1972).

Whilst interest in the abstract selection task continues to this day, much of the recent literature concerns versions using realistic content. Wason, however, was the first to demonstrate the importance of content. He reported an experiment in which the cards referred to destinations and modes of transport: Manchester, Leeds, Train, Car, and the rule was *Every time I go to Manchester I travel by train* (Wason & Shapiro, 1971). The majority of subjects now made the correct selection of the Manchester and Car cards. These results appeared to show that effective adult reasoning was dependent on the use of concrete, realistic content—in direct contradiction to the Piagetian claim that children mastered formal patterns of inference around the age of 12. Once again, the defenders of human rationality fought back. The task was said not to engage deductive reasoning, and a slew of alternative accounts appeared in the literature. No other task eliciting higher cognition has generated such a large literature. It continues to do so. And to the very end, Wason was delighted that no single theory appears to explain all the phenomena.

Dual process accounts of thinking and reasoning have become frequent in the recent literature on thinking and reasoning (Evans & Over, 1996; Sloman, 1996; Stanovich, 1999) and are now applied to judgement and decision making (Kahneman & Frederick, 2002). Readers may not sufficiently appreciate Wason's role in the early development of this idea. As we mentioned earlier, he was fascinated by the fixated behaviour of subjects in the 2-4-6 problem and their tendency to reformulate the *same* rules. The notion that verbalisations might be no more than *rationalisations* of unconscious biases was developed in the first paper to propose a dual process account of reasoning phenomena in the selection task (Wason & Evans, 1975). Wason coined the terms type 1 and type 2 processes to distinguish between rapid error-prone unconscious processes and slower deliberative ones. He commented on some earlier selection task experiments (reported in Wason & Johnson-Laird, 1972) as follows:

> These experiments suggested that subjects tended to engage in highly distinctive rationalisations to preserve an initial erroneous solution in the face of contradictory evidence. For example, they may insist that cards are 'irreversible' or acknowledge that a card satisfies the rule, but then deny its relevance. Such phenomena seem to reveal distinct thought processes which fail to interact, so that conflict may remain unresolved. (Wason & Evans, 1975, p. 151).

The selection task focused on conditionals; the THOG-problem, which Wason (1977a; Wason & Brooks, 1979) also devised, focused on exclusive disjunctions. You are shown a white diamond, a black diamond, a white circle, and a black circle. The experimenter tells you:

> There is a particular shape and a particular colour, such that any one of these four designs that has *one*, and only *one*, of these features is called a THOG. The black diamond is a THOG.

Your task is to state which of the three remaining shapes are THOGs, which are not THOGs, and which are impossible to classify. Most people say that the white circle is not a THOG, and the other two shapes are impossible to classify. Other responses, including the correct one, are quite frequent. To make the correct classification, you need to realize that the information that the black diamond is a THOG implies that two alternative sets of features are relevant to the definition of THOGS:

black circle
or else:
white diamond.

A shape is a THOG if it has one, and only one, feature from each of these two sets. The black diamond and the white circle are accordingly THOGS. Any shape that has both features in one of the sets is not a THOG, i.e., neither the black circle nor the white diamond are THOGs. The source of the frequent error may be the difficulty of holding in mind two alternative sets of features and keeping them apart from THOGs themselves.

Any brief survey of Wason's research must comment on his views about rationality. He began his researches into reasoning with no knowledge of Piaget's theorizing, but he soon grasped that his results were incompatible with the view that humans are impeccably rational. In turn, he became critical of the idea that adults reasoned on the basis of Piagetian formal operations (Wason, 1977b): his experiments had shown that individuals often departed from the canons of formal logic, and that their reasoning was influenced by content. However, he did not entirely accept orthodox logic as the correct normative framework. He argued, for instance, that a conditional in daily life had a "defective" truth table, i.e., it was neither true nor false when its antecedent was false (Wason, 1966). His typical standard for assessing error was that individuals had violated their own norms. And that was why he so cherished those interviews with subjects in which they came to realize that they had erred. He even demonstrated experimentally that subjects whose faulty reasoning led them into self-contradiction showed a subsequent benefit as a result of the experience (Wason, 1964, 1977a).

Wason's strong assertions about human irrationality made him a target. When the Oxford philosopher L. J. Cohen launched his attack on cognitive biases, Wason's work as well as Kahneman and Tversky's was in the firing line (Cohen, 1981). Wason's response to Cohen was robust and unrepentant:

> He is obviously wrong to claim that "a few moments' prompted reflection" would enable subjects to admit that their reasoning had been invalid. … errors are often systematic and resistant to correction
> (Wason, 1983, p. 59).

He added that Cohen's theory of rational competence was unfalsifiable.

Not all of Wason's research concerned rationality. He also addressed the practical problem of understanding rules and regulations. Sheila Jones and he followed up the idea of their colleague, A. R. Jonckheere, that complex rules might be easier to understand if they were presented as logical trees in which the particular answer to a question directs the reader to the next appropriate question. This investigation may also have been prompted in part by Wason's collection of "golden sentences", i.e., sentences culled from his students' drafts that were ponderous and stuffed with jargon to the point of incomprehensibility. (If you committed one of these sentences, he would ask you to read it aloud—until its awfulness impinged even on you.) The first step in the investigation showed that clerks in Government offices did not understand the complex documents that they handed out to explain such matters as the "Death grant", which was to help to pay for a spouse's funeral. The second step showed that civil servants of the executive class understood such complex rules more readily when they were expressed in logical trees. The final step came when the late Richard Crossman, who was then the Minister of Health, paid a flying visit to UCL. Jones and Wason made a vigorous attempt to persuade the Minister of the virtues of logical trees. Alas, he thought the idea was ludicrous. People would understand government leaflets; they would get what was owed to them; it would cost the Government too much.

When Wason took early retirement, he announced that he would play no further active part in the field. By and large he stuck to this resolve for the last 20 years of his life, concentrating instead on correspondence chess, which he played at the level of an International Master. Yet, as a distant spectator, he was delighted to see the research field—one that he did more than anyone else to found—blossom into a major international enterprise. As his former PhD students, the present authors owe him much. He was an inspiration. We were never quite able to follow all his advice or his genius for inventing wonderful cognitive problems for experimental investigation. His seminar for graduate students and others was a unique education. You talked about the research you proposed to do: the goal of the other participants was to suggest creative improvements. His emphasis was always on imagination and the discovery of an interesting problem. He told you not to read the literature until *after* you had carried out your experiment. His early education in English literature shone through in the simplicity and clarity of his writing. It remains impossible to emulate him in full, and that is a measure of his importance as a psychologist.

JONATHAN ST. B. T. EVANS
University of Plymouth, UK

PHILIP N. JOHNSON-LAIRD
Princeton University, NJ, USA

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