should there not be more research to explore and document the impact of different mental models?[18]

The reaction of the Intelligence Community to many problems is to collect more information, even though analysts in many cases already have more information than they can digest. What analysts need is more truly useful information—mostly reliable HUMINT from knowledgeable insiders—to help them make good decisions. Or they need a more accurate mental model and better analytical tools to help them sort through, make sense of, and get the most out of the available ambiguous and conflicting information.

Psychological research also offers to intelligence analysts additional insights that are beyond the scope of this book. Problems are not limited to how analysts perceive and process information. Intelligence analysts often work in small groups and always within the context of a large, bureaucratic organization. Problems are inherent in the processes that occur at all three levels—individual, small group, and organization. This book focuses on problems inherent in analysts' mental processes, inasmuch as these are probably the most insidious. Analysts can observe and get a feel for these problems in small-group and organizational processes, but it is very difficult, at best, to be self-conscious about the workings of one's own mind.

18. Graham Allison's work on the Cuban missile crisis (*Essence of Decision*, Little, Brown & Co., 1971) is an example of what I have in mind. Allison identified three alternative assumptions about how governments work—a rational actor model, an organizational process model, and a bureaucratic politics model. He then showed how an analyst's implicit assumptions about the most appropriate model for analyzing a foreign government's behavior can cause him or her to focus on different evidence and arrive at different conclusions. Another example is my own analysis of five alternative paths for making counterintelligence judgments in the controversial case of KGB defector Yuriy Nosenko: Richards J. Heuer, Jr., "Nosenko: Five Paths to Judgment," *Studies in Intelligence*, Vol. 31, No. 3 (Fall 1987), originally classified Secret but declassified and published in H. Bradford Westerfield, ed., *Inside CIA's Private World: Declassified Articles from the Agency's Internal Journal 1955-1992* (New Haven: Yale University Press, 1995).

Chapter 2

Perception: Why Can't We See What Is There To Be Seen?

The process of perception links people to their environment and is critical to accurate understanding of the world about us. Accurate intelligence analysis obviously requires accurate perception. Yet research into human perception demonstrates that the process is beset by many pitfalls. Moreover, the circumstances under which intelligence analysis is conducted are precisely the circumstances in which accurate perception tends to be the most difficult. This chapter discusses perception in general, then applies this information to illuminate some of the difficulties of intelligence analysis.[19]

* *

People tend to think of perception as a passive process. We see, hear, smell, taste or feel stimuli that impinge upon our senses. We think that if we are at all objective, we record what is actually there. Yet perception is demonstrably an active rather than a passive process; it constructs rather than records "reality." Perception implies understanding as well as awareness. It is a process of inference in which people construct their own version of reality on the basis of information provided through the five senses.

As already noted, what people in general and analysts in particular perceive, and how readily they perceive it, are strongly influenced by their past experience, education, cultural values, and role requirements, as well as by the stimuli recorded by their receptor organs.

Many experiments have been conducted to show the extraordinary extent to which the information obtained by an observer depends upon the observer's own assumptions and preconceptions. For example, when

19. An earlier version of this article was published as part of "Cognitive Factors in Deception and Counterdeception," in Donald C. Daniel and Katherine L. Herbig, eds., *Strategic Military Deception* (Pergamon Press, 1982).

you looked at figure 1 above, what did you see? Now refer to the footnote for a description of what is actually there.[20] Did you perceive Figure 1 correctly? If so, you have exceptional powers of observation, were lucky, or have seen the figure before. This simple experiment demonstrates one of the most fundamental principles concerning perception:

Figure 1

We tend to perceive what we expect to perceive.

A corollary of this principle is that it takes more information, and more unambiguous information, to recognize an unexpected phenomenon than an expected one.

One classic experiment to demonstrate the influence of expectations on perception used playing cards, some of which were gimmicked so the spades were red and the hearts black. Pictures of the cards were flashed briefly on a screen and, needless to say, the test subjects identified the normal cards more quickly and accurately than the anomalous ones. After test subjects became aware of the existence of red spades and black hearts, their performance with the gimmicked cards improved but still did not approach the speed or accuracy with which normal cards could be identified.[21]

20. The article is written twice in each of the three phrases. This is commonly overlooked because perception is influenced by our expectations about how these familiar phrases are normally written.

21. Jerome S. Bruner and Leo Postman, "On the Perception of Incongruity: A Paradigm," in Jerome S. Bruner and David Kraut, eds., *Perception and Personality: A Symposium* (New York: Greenwood Press, 1968).

lysts generally means instruction in organizational procedures, methodological techniques, or substantive topics. More training time should be devoted to the mental act of thinking or analyzing. It is simply assumed, incorrectly, that analysts know how to analyze. This book is intended to support training that examines the thinking and reasoning processes involved in intelligence analysis.

As discussed in the next chapter, mind-sets and mental models are inescapable. They are, in essence, a distillation of all that we think we know about a subject. The problem is how to ensure that the mind remains open to alternative interpretations in a rapidly changing world.

The disadvantage of a mind-set is that it can color and control our perception to the extent that an experienced specialist may be among the last to see what is really happening when events take a new and unexpected turn. When faced with a major paradigm shift, analysts who know the most about a subject have the most to unlearn. This seems to have happened before the reunification of Germany, for example. Some German specialists had to be prodded by their more generalist supervisors to accept the significance of the dramatic changes in progress toward reunification of East and West Germany.

The advantage of mind-sets is that they help analysts get the production out on time and keep things going effectively between those watershed events that become chapter headings in the history books.[17]

A generation ago, few intelligence analysts were self-conscious and introspective about the process by which they did analysis. The accepted wisdom was the "common sense" theory of knowledge—that to perceive events accurately it was necessary only to open one's eyes, look at the facts, and purge oneself of all preconceptions and prejudices in order to make an objective judgment.

Today, there is greatly increased understanding that intelligence analysts do not approach their tasks with empty minds. They start with a set of assumptions about how events normally transpire in the area for which they are responsible. Although this changed view is becoming conventional wisdom, the Intelligence Community has only begun to scratch the surface of its implications.

If analysts' understanding of events is greatly influenced by the mind-set or mental model through which they perceive those events,

17. This wording is from a discussion with veteran CIA analyst, author, and teacher Jack Davis.

experiments in cognitive psychology rather than through examples from diplomatic and military history.

A central focus of this book is to illuminate the role of the observer in determining what is observed and how it is interpreted. People construct their own version of "reality" on the basis of information provided by the senses, but this sensory input is mediated by complex mental processes that determine which information is attended to, how it is organized, and the meaning attributed to it. What people perceive, how readily they perceive it, and how they process this information after receiving it are all strongly influenced by past experience, education, cultural values, role requirements, and organizational norms, as well as by the specifics of the information received.

This process may be visualized as perceiving the world through a lens or screen that channels and focuses and thereby may distort the images that are seen. To achieve the clearest possible image of China, for example, analysts need more than information on China. They also need to understand their own lenses through which this information passes. These lenses are known by many terms—mental models, mind-sets, biases, or analytical assumptions.

In this book, the terms mental model and mind-set are used more or less interchangeably, although a mental model is likely to be better developed and articulated than a mind-set. An analytical assumption is one part of a mental model or mind-set. The biases discussed in this book result from how the mind works and are independent of any substantive mental model or mind-set.

Before obtaining a license to practice, psychoanalysts are required to undergo psychoanalysis themselves in order to become more aware of how their own personality interacts with and conditions their observations of others. The practice of psychoanalysis has not been so successful that its procedures should be emulated by the intelligence and foreign policy community. But the analogy highlights an interesting point: Intelligence analysts must understand themselves before they can understand others. Training is needed to (a) increase self-awareness concerning generic problems in how people perceive and make analytical judgments concerning foreign events, and (b) provide guidance and practice in overcoming these problems.

Not enough training is focused in this direction—that is, inward toward the analyst's own thought processes. Training of intelligence ana-

This experiment shows that patterns of expectation become so deeply embedded that they continue to influence perceptions even when people are alerted to and try to take account of the existence of data that do not fit their preconceptions. Trying to be objective does not ensure accurate perception.

The position of the test subject identifying playing cards is analogous to that of the intelligence analyst or government leader trying to make sense of the paper flow that crosses his or her desk. What is actually perceived in that paper flow, as well as how it is interpreted, depends in part, at least, on the analyst's patterns of expectation. Analysts do not just have expectations about the color of hearts and spades. They have a set of assumptions and expectations about the motivations of people and the processes of government in foreign countries. Events consistent with these expectations are perceived and processed easily, while events that contradict prevailing expectations tend to be ignored or distorted in perception. Of course, this distortion is a subconscious or pre-conscious process, as illustrated by how you presumably ignored the extra words in the triangles in Figure 1.

This tendency of people to perceive what they *expect* to perceive is more important than any tendency to perceive what they *want* to perceive. In fact, there may be no real tendency toward wishful thinking. The commonly cited evidence supporting the claim that people tend to perceive what they want to perceive can generally be explained equally well by the expectancy thesis.[22]

Expectations have many diverse sources, including past experience, professional training, and cultural and organizational norms. All these influences predispose analysts to pay particular attention to certain kinds of information and to organize and interpret this information in certain ways. Perception is also influenced by the context in which it occurs. Different circumstances evoke different sets of expectations. People are more attuned to hearing footsteps behind them when walking in an alley at night than along a city street in daytime, and the meaning attributed to the sound of footsteps will vary under these differing circumstances. A military intelligence analyst may be similarly tuned to perceive indicators of potential conflict.

22. For discussion of the ambiguous evidence concerning the impact of desires and fears on judgment, see Robert Jervis, *Perception and Misperception in International Politics* (Princeton, NJ: Princeton University Press, 1976), Chapter 10.

Patterns of expectations tell analysts, subconsciously, what to look for, what is important, and how to interpret what is seen. These patterns form a mind-set that predisposes analysts to think in certain ways. A mind-set is akin to a screen or lens through which one perceives the world.

There is a tendency to think of a mind-set as something bad, to be avoided. According to this line of argument, one should have an open mind and be influenced only by the facts rather than by preconceived notions! That is an unreachable ideal. There is no such thing as "the facts of the case." There is only a very selective subset of the overall mass of data to which one has been subjected that one takes as facts and judges to be relevant to the question at issue.

Actually, mind-sets are neither good nor bad; they are unavoidable. People have no conceivable way of coping with the volume of stimuli that impinge upon their senses, or with the volume and complexity of the data they have to analyze, without some kind of simplifying preconceptions about what to expect, what is important, and what is related to what. "There is a grain of truth in the otherwise pernicious maxim that an open mind is an empty mind."23 Analysts do not achieve objective analysis by avoiding preconceptions; that would be ignorance or self-delusion. Objectivity is achieved by making basic assumptions and reasoning as explicit as possible so that they can be challenged by others and analysts can, themselves, examine their validity.

One of the most important characteristics of mind-sets is:

Mind-sets tend to be quick to form but resistant to change.

Figure 2 illustrates this principle by showing part of a longer series of progressively modified drawings that change almost imperceptibly from a man into a woman.24 The right-hand drawing in the top row, when viewed alone, has equal chances of being perceived as a man or a woman. When test subjects are shown the entire series of drawings one by one, their perception of this intermediate drawing is biased according to which end of the series they start from. Test subjects who start by viewing a picture that is clearly a man are biased in favor of continuing

23. Richard Betts, "Analysis, War and Decision: Why Intelligence Failures are Inevitable", World Politics, Vol. XXXI (October 1978), p. 84.
24. Drawings devised by Gerald Fisher in 1967.

mind cannot cope directly with the complexity of the world. Rather, we construct a simplified mental model of reality and then work with this model. We behave rationally within the confines of our mental model, but this model is not always well adapted to the requirements of the real world. The concept of bounded rationality has come to be recognized widely, though not universally, both as an accurate portrayal of human judgment and choice and as a sensible adjustment to the limitations inherent in how the human mind functions.14

Much psychological research on perception, memory, attention span, and reasoning capacity documents the limitations in our "mental machinery" identified by Simon. Many scholars have applied these psychological insights to the study of international political behavior.15 A similar psychological perspective underlies some writings on intelligence failure and strategic surprise.16

This book differs from those works in two respects. It analyzes problems from the perspective of intelligence analysts rather than policymakers. And it documents the impact of mental processes largely through

14. James G. March., "Bounded Rationality, Ambiguity, and the Engineering of Choice," in David E. Bell, Howard Raiffa, and Amos Tversky, eds., Decision Making Descriptive, Normative, and Prescriptive Interactions (Cambridge University Press, 1988).
15. Among the early scholars who wrote on this subject were Joseph De Rivera, The Psychological Dimension of Foreign Policy (Columbus, OH: Merrill, 1968), Alexander George and Richard Smoke, Deterrence in American Foreign Policy (New York: Columbia University Press, 1974), and Robert Jervis, Perception and Misperception in International Politics (Princeton, NJ: Princeton University Press, 1976).
16. Christopher Brady, "Intelligence Failures: Plus Ça Change. . ." Intelligence and National Security, Vol. 8, No. 4 (October 1993). N. Cigar, "Iraq's Strategic Mindset and the Gulf War: Blueprint for Defeat," The Journal of Strategic Studies, Vol. 15, No. 1 (March 1992), J.J. Wirtz, The Tet Offensive: Intelligence Failure in War (New York, 1991), Ephraim Kam, Surprise Attack (Harvard University Press, 1988), Richard Betts, Surprise Attack: Lessons for Defense Planning (Brookings, 1982), Abraham Ben-Zvi, "The Study of Surprise Attacks," British Journal of International Studies, Vol. 5 (1979), Richard Betts, "Analysis, War and Decision: Why Intelligence Failures Are Inevitable," World Politics, Vol. 31, No. 1 (October 1978), Richard W. Shryock, "The Intelligence Community Post-Mortem Program, 1973-1975," Studies in Intelligence, Vol. 21, No. 1 (Fall 1977), Avi Schlaim, "Failures in National Intelligence Estimates: The Case of the Yom Kippur War," World Politics, Vol. 28 (April 1976). Michael Handel, Perception, Deception, and Surprise: The Case of the Yom Kippur War (Jerusalem: Leonard Davis Institute of International Relations, Jerusalem Paper No. 19, 1976). Klaus Knorr, "Failures in National Intelligence Estimates: The Case of the Cuban Missiles," World Politics, Vol. 16 (1964).

of the analytical process. Little attention is devoted to improving how analysts think.

Thinking analytically is a skill like carpentry or driving a car. It can be taught, it can be learned, and it can improve with practice. But like many other skills, such as riding a bike, it is not learned by sitting in a classroom and being told how to do it. Analysts learn by doing. Most people achieve at least a minimally acceptable level of analytical performance with little conscious effort beyond completing their education. With much effort and hard work, however, analysts can achieve a level of excellence beyond what comes naturally.

Regular running enhances endurance but does not improve technique without expert guidance. Similarly, expert guidance may be required to modify long-established analytical habits to achieve an optimal level of analytical excellence. An analytical coaching staff to help young analysts hone their analytical tradecraft would be a valuable supplement to classroom instruction.
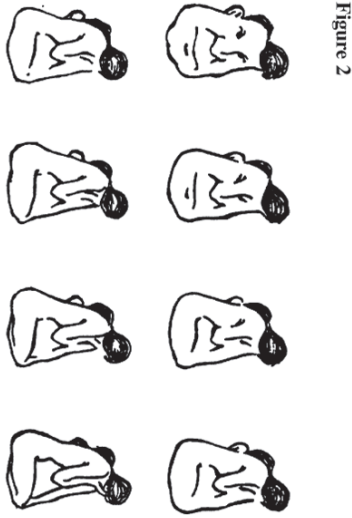
One key to successful learning is motivation. Some of CIA's best analysts developed their skills as a consequence of experiencing analytical failure early in their careers. Failure motivated them to be more self-conscious about how they do analysis and to sharpen their thinking process.

This book aims to help intelligence analysts achieve a higher level of performance. It shows how people make judgments based on incomplete and ambiguous information, and it offers simple tools and concepts for improving analytical skills.

Part I identifies some limitations inherent in human mental processes. Part II discusses analytical tradecraft—simple tools and approaches for overcoming these limitations and thinking more systematically. Chapter 8, "Analysis of Competing Hypotheses," is arguably the most important single chapter. Part III presents information about cognitive biases—the technical term for predictable mental errors caused by simplified information processing strategies. A final chapter presents a checklist for analysts and recommendations for how managers of intelligence analysis can help create an environment in which analytical excellence flourishes.

Herbert Simon first advanced the concept of "bounded" or limited rationality.[13] Because of limits in human mental capacity, he argued, the

13. Herbert Simon, *Models of Man*, 1957.

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to see a man long after an "objective observer" (for example, an observer who has seen only a single picture) recognizes that the man is now a woman. Similarly, test subjects who start at the woman end of the series are biased in favor of continuing to see a woman. Once an observer has formed an image—that is, once he or she has developed a mind-set or expectation concerning the phenomenon being observed—this conditions future perceptions of that phenomenon.

This is the basis for another general principle of perception:

New information is assimilated to existing images.

This principle explains why gradual, evolutionary change often goes unnoticed. It also explains the phenomenon that an intelligence analyst assigned to work on a topic or country for the first time may generate accurate insights that have been overlooked by experienced analysts who have worked on the same problem for 10 years. A fresh perspective is sometimes useful; past experience can handicap as well as aid analysis. This tendency to assimilate new data into pre-existing images is greater "the more ambiguous the information, the more confident the actor is of

Figure 2

Impressions resist change.

Figure 3

It is difficult to look at the same information from different perspectives.

the validity of his image, and the greater his commitment to the established view."[25]

The drawing in Figure 3 provides the reader an opportunity to test for him or herself the persistence of established images.[26] Look at Figure 3. What do you see—an old woman or a young woman? Now look again to see if you can visually and mentally reorganize the data to form a different image—that of a young woman if your original perception was of an old woman, or of the old woman if you first perceived the young one. If necessary, look at the footnote for clues to help you identify the other

25. Jervis, p. 195.

26. This picture was originally published in *Puck* magazine in 1915 as a cartoon entitled "My Wife and My Mother-in-Law."

PART 1—OUR MENTAL MACHINERY

Chapter 1

Thinking About Thinking

Of the diverse problems that impede accurate intelligence analysis, those inherent in human mental processes are surely among the most important and most difficult to deal with. Intelligence analysis is fundamentally a mental process, but understanding this process is hindered by the lack of conscious awareness of the workings of our own minds.

A basic finding of cognitive psychology is that people have no conscious experience of most of what happens in the human mind. Many functions associated with perception, memory, and information processing are conducted prior to and independently of any conscious direction. What appears spontaneously in consciousness is the result of thinking, not the process of thinking.

Weaknesses and biases inherent in human thinking processes can be demonstrated through carefully designed experiments. They can be alleviated by conscious application of tools and techniques that should be in the analytical tradecraft toolkit of all intelligence analysts.

* *

"When we speak of improving the mind we are usually referring to the acquisition of information or knowledge, or to the type of thoughts one should have, and not to the actual functioning of the mind. We spend little time monitoring our own thinking and comparing it with a more sophisticated ideal."[12]

When we speak of improving intelligence analysis, we are usually referring to the quality of writing, types of analytical products, relations between intelligence analysts and intelligence consumers, or organization

12. James L. Adams, *Conceptual Blockbusting: A Guide to Better Ideas* (New York: W.W. Norton, second edition, 1980), p. 3.

image.[27] Again, this exercise illustrates the principle that mind-sets are quick to form but resistant to change.

When you have seen Figure 3 from *both* perspectives, try shifting back and forth from one perspective to the other. Do you notice some initial difficulty in making this switch? One of the more difficult mental feats is to take a familiar body of data and reorganize it visually or mentally to perceive it from a different perspective. Yet this is what intelligence analysts are constantly required to do. In order to understand international interactions, analysts must understand the situation as it appears to each of the opposing forces, and constantly shift back and forth from one perspective to the other as they try to fathom how each side interprets an ongoing series of interactions. Trying to perceive an adversary's interpretations of international events, as well as US interpretations of those same events, is comparable to seeing both the old and young woman in Figure 3. Once events have been perceived one way, there is a natural resistance to other perspectives.

A related point concerns the impact of substandard conditions of perception. The basic principle is:

Initial exposure to blurred or ambiguous stimuli interferes with accurate perception even after more and better information becomes available.

This effect has been demonstrated experimentally by projecting onto a screen pictures of common, everyday subjects such as a dog standing on grass, a fire hydrant, and an aerial view of a highway cloverleaf intersection.[28] The initial projection was blurred in varying degrees, and the pictures were then brought into focus slowly to determine at what point test subjects could identify them correctly.

This experiment showed two things. First, those who started viewing the pictures when they were most out of focus had more difficulty identifying them when they became clearer than those who started view-

27. The old woman's nose, mouth, and eye are, respectively, the young woman's chin, necklace, and ear. The old woman is seen in profile looking left. The young woman is also looking left, but we see her mainly from behind so most facial features are not visible. Her eyelash, nose, and the curve of her cheek may be seen just above the old woman's nose.
28. Jerome S. Bruner and Mary C. Potter, "Interference in Visual Recognition," *Science*, Vol. 144 (1964), pp. 424-25.

ing at a less blurred stage. In other words, the greater the initial blur, the clearer the picture had to be before people could recognize it. Second, the longer people were exposed to a blurred picture, the clearer the picture had to be before they could recognize it.

What happened in this experiment is what presumably happens in real life; despite ambiguous stimuli, people form some sort of tentative hypothesis about what they see. The longer they are exposed to this blurred image, the greater confidence they develop in this initial and perhaps erroneous impression, so the greater the impact this initial impression has on subsequent perceptions. For a time, as the picture becomes clearer, there is no *obvious* contradiction; the new data are assimilated into the previous image, and the initial interpretation is maintained until the contradiction becomes so obvious that it forces itself upon our consciousness.

The early but incorrect impression tends to persist because the amount of information necessary to invalidate a hypothesis is considerably greater than the amount of information required to make an initial interpretation. The problem is not that there is any inherent difficulty in grasping new perceptions or new ideas, but that established perceptions are so difficult to change. People form impressions on the basis of very little information, but once formed, they do not reject or change them unless they obtain rather solid evidence. Analysts might seek to limit the adverse impact of this tendency by suspending judgment for as long as possible as new information is being received.

Implications for Intelligence Analysis

Comprehending the nature of perception has significant implications for understanding the nature and limitations of intelligence analysis. The circumstances under which accurate perception is most difficult are exactly the circumstances under which intelligence analysis is generally conducted—dealing with highly ambiguous situations on the basis of information that is processed incrementally under pressure for early judgment. This is a recipe for inaccurate perception.

Intelligence analysis deals with highly ambiguous situations. As previously noted, the greater the ambiguity of the stimuli, the greater the impact of expectations and pre-existing images on the perception of that

I offer some concluding observations and recommendations, rooted in Heuer's findings and taking into account the tough tradeoffs facing intelligence professionals:

• *Commit to a uniform set of tradecraft standards based on the insights in this book.* Leaders need to know if analysts have done their cognitive homework before taking corporate responsibility for their judgments. Although every analytical issue can be seen as one of a kind, I suspect that nearly all such topics fit into about a dozen recurring patterns of challenge based largely on variations in substantive uncertainty and policy sensitivity. Corporate standards need to be established for each such category. And the burden should be put on managers to explain why a given analytical assignment requires deviation from the standards. I am convinced that if tradecraft standards are made uniform and transparent, the time saved by curtailing personalistic review of quick-turnaround analysis (e.g., "It reads better to me this way") could be "re-invested" in doing battle more effectively against cognitive pitfalls. ("Regarding point 3, let's talk about your assumptions.")

• *Pay more honor to "doubt."* Intelligence leaders and policymakers should, in recognition of the cognitive impediments to sound analysis, establish ground rules that enable analysts, after doing their best to clarify an issue, to express doubts more openly. They should be encouraged to list gaps in information and other obstacles to confident judgment. Such conclusions as "We do not know" or "There are several potentially valid ways to assess this issue" should be regarded as badges of sound analysis, not as dereliction of analytic duty.

• *Find a couple of successors to Dick Heuer. Fund their research. Heed their findings.*

The courses influenced scores of DI analysts, many of whom are now in the managerial ranks. The designers and teachers of Tradecraft 2000 clearly were also influenced by Heuer, as reflected in reading selections, case studies, and class exercises.

Heuer's work has remained on reading lists and in lesson plans for DI training courses offered to all new analysts, as well as courses on warning analysis and on countering denial and deception. Senior analysts and managers who have been directly exposed to Heuer's thinking through his articles, or through training courses, continue to pass his insights on to newer analysts.

Recommendations

Heuer's advice to Agency leaders, managers, and analysts is pointed: To ensure sustained improvement in assessing complex issues, analysis must be treated as more than a substantive and organizational process. Attention also must be paid to techniques and tools for coping with the inherent limitations on analysts' mental machinery. He urges that Agency leaders take steps to:

- *Establish an organizational environment* that promotes and rewards the kind of critical thinking he advocates—or example, analysis on difficult issues that considers in depth a series of plausible hypotheses rather than allowing the first credible hypothesis to suffice.

- *Expand funding for research* on the role such mental processes play in shaping analytical judgments. An Agency that relies on sharp cognitive performance by its analysts must stay abreast of studies on how the mind works—i.e., on *how* analysts reach judgments.

- *Foster development of tools* to assist analysts in assessing information. On tough issues, they need help in improving their mental models and in deriving incisive findings from information they already have; they need such help at least as much as they need more information.

stimuli. Thus, despite maximum striving for objectivity, the intelligence analyst's own preconceptions are likely to exert a greater impact on the analytical product than in other fields where an analyst is working with less ambiguous and less discordant information.

Moreover, the intelligence analyst is among the first to look at new problems at an early stage when the evidence is very fuzzy indeed. The analyst then follows a problem as additional increments of evidence are received and the picture gradually clarifies—as happened with test subjects in the experiment demonstrating that initial exposure to blurred stimuli interferes with accurate perception even after more and better information becomes available. If the results of this experiment can be generalized to apply to intelligence analysis, the experiment suggests that an analyst who starts observing a potential problem situation at an early and unclear stage is at a disadvantage as compared with others, such as policymakers, whose first exposure may come at a later stage when more and better information is available.

The receipt of information in small increments over time also facilitates assimilation of this information into the analyst's existing views. No one item of information may be sufficient to prompt the analyst to change a previous view. The cumulative message inherent in many pieces of information may be significant but is attenuated when this information is not examined as a whole. The Intelligence Community's review of its performance before the 1973 Arab-Israeli War noted:

The problem of incremental analysis—especially as it applies to the current intelligence process—was also at work in the period preceding hostilities. Analysts, according to their own accounts, were often proceeding on the basis of the day's take, hastily comparing it with material received the previous day. They then produced in 'assembly line fashion' items which may have reflected perceptive intuition but which [did not] accrue from a systematic consideration of an accumulated body of integrated evidence.[29]

And finally, the intelligence analyst operates in an environment that exerts strong pressures for what psychologists call premature closure.

29 *The Performance of the Intelligence Community Before the Arab-Israeli War of October 1973: A Preliminary Post-Mortem Report*, December 1973. The one-paragraph excerpt from this post-mortem, as quoted in the text above, has been approved for public release, as was the title of the post-mortem, although that document as a whole remains classified.

Customer demand for interpretive analysis is greatest within two or three days after an event occurs. The system requires the intelligence analyst to come up with an almost instant diagnosis before sufficient hard information, and the broader background information that may be needed to gain perspective, become available to make possible a well-grounded judgment. This diagnosis can only be based upon the analyst's preconceptions concerning how and why events normally transpire in a given society.

As time passes and more information is received, a fresh look at all the evidence might suggest a different explanation. Yet, the perception experiments indicate that an early judgment adversely affects the formation of future perceptions. Once an observer thinks he or she knows what is happening, this perception tends to resist change. New data received incrementally can be fit easily into an analyst's previous image. This perceptual bias is reinforced by organizational pressures favoring consistent interpretation; once the analyst is committed in writing, both the analyst and the organization have a vested interest in maintaining the original assessment.

That intelligence analysts perform as well as they do is testimony to their generally sound judgment, training, and dedication in performing a dauntingly difficult task.

The problems outlined here have implications for the management as well as the conduct of analysis. Given the difficulties inherent in the human processing of complex information, a prudent management system should:

- Support analyses that periodically re-examine key problems from the ground up in order to avoid the pitfalls of the incremental approach.

- Emphasize procedures that expose and elaborate alternative points of view.

- Educate consumers about the limitations as well as the capabilities of intelligence analysis; define a set of realistic expectations as a standard against which to judge analytical performance.

- Encourage products that clearly delineate their assumptions and chains of inference and that specify the degree and source of uncertainty involved in the conclusions.

foreign beliefs and behavior as hypotheses to be challenged. Alternative hypotheses need to be carefully considered—especially those that cannot be *disproved* on the basis of available information.

Heuer's concept of "Analysis of Competing Hypotheses" (ACH) is among his most important contributions to the development of an intelligence analysis methodology. At the core of ACH is the notion of competition among a series of plausible hypotheses to see which ones survive a gauntlet of testing for compatibility with available information. The surviving hypotheses—those that have not been disproved—are subjected to further testing. ACH, Heuer concedes, will not always yield the right answer. But it can help analysts overcome the cognitive limitations discussed in his book.

Some analysts who use ACH follow Heuer's full eight-step methodology. More often, they employ some elements of ACH—especially the use of available information to challenge the hypotheses that the analyst favors the most.

Denial and Deception

Heuer's path-breaking work on countering denial and deception (D&D) was not included as a separate chapter in this volume. But his brief references here are persuasive.

He notes, for example, that analysts often reject the possibility of deception because they see no evidence of it. He then argues that rejection is not justified under these circumstances. If deception is well planned and properly executed, one should not expect to see evidence of it readily at hand. Rejecting a plausible but unproven hypothesis too early tends to bias the subsequent analysis, because one does not then look for the evidence that might support it. The possibility of deception should not be rejected until it is disproved or, at least, until a systematic search for evidence has been made and none has been found.

Heuer's Impact

Heuer's influence on analytic tradecraft began with his first articles. CIA officials who set up training courses in the 1980s as part of then-DDI Gates's quest for improved analysis shaped their lesson plans partly on the basis of Heuer's findings. Among these courses were a seminar on intelligence successes and failures and another on intelligence analysis.

need to understand the lenses through which this information passes. These lenses are known by many terms—mental models, mind-sets, biases, or analytic assumptions.

In essence, Heuer sees reliance on mental models to simplify and interpret reality as an unavoidable conceptual mechanism for intelligence analysts—often useful, but at times hazardous. What is required of analysts, in his view, is a commitment to *challenge, refine, and challenge again* their own working mental models, precisely because these steps are central to sound interpretation of complex and ambiguous issues.

Throughout the book, Heuer is critical of the orthodox prescription of "more and better information" to remedy unsatisfactory analytic performance. He urges that greater attention be paid instead to more intensive exploitation of information already on hand, and that in so doing, analysts continuously challenge and revise their mental models.

Heuer sees *mirror-imaging* as an example of an unavoidable cognitive trap. No matter how much expertise an analyst applies to interpreting the value systems of foreign entities, when the hard evidence runs out the tendency to project the analyst's own mind-set takes over. In Chapter 4, Heuer observes:

To see the options faced by foreign leaders as these leaders see them, one must understand their values and assumptions and even their misperceptions and misunderstandings. Without such insight, interpreting foreign leaders' decisions or forecasting future decisions is often nothing more than partially informed speculation. Too frequently, foreign behavior appears "irrational" or "not in their own best interest." Such conclusions often indicate analysts have projected American values and conceptual frameworks onto the foreign leaders and societies, rather than understanding the logic of the situation as it appears to them.

Competing Hypotheses
To offset the risks accompanying analysts' inevitable recourse to mirror-imaging, Heuer suggests looking upon analysts' calculations about

Chapter 3
Memory: How Do We Remember What We Know?

Differences between stronger and weaker analytical performance are attributable in large measure to differences in the organization of data and experience in analysts' long-term memory. The contents of memory form a continuous input into the analytical process, and anything that influences what information is remembered or retrieved from memory also influences the outcome of analysis.

This chapter discusses the capabilities and limitations of several components of the memory system. Sensory information storage and short-term memory are beset by severe limitations of capacity, while long-term memory, for all practical purposes, has a virtually infinite capacity. With long-term memory, the problems concern getting information into it and retrieving information once it is there, not physical limits on the amount of information that may be stored. Understanding how memory works provides insight into several analytical strengths and weaknesses.

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Components of the Memory System

What is commonly called memory is not a single, simple function. It is an extraordinarily complex system of diverse components and processes. There are at least three, and very likely more, distinct memory processes. The most important from the standpoint of this discussion and best documented by scientific research are sensory information stor-

age (SIS), short-term memory (STM), and long-term memory (LTM).[30] Each differs with respect to function, the length of time information is retained, and the form of information held, the length of time information is retained, and the amount of information-handling capacity. Memory researchers also posit the existence of an interpretive mechanism and an overall memory monitor or control mechanism that guides interaction among various elements of the memory system.

Sensory Information Storage

Sensory information storage holds sensory images for several tenths of a second after they are received by the sensory organs. The functioning of SIS may be observed if you close your eyes, then open and close them again as rapidly as possible. As your eyes close, notice how the visual image is maintained for a fraction of a second before fading. Sensory information storage explains why a movie film shot at 16 separate frames per second appears as continuous movement rather than a series of still pictures. A visual trace is generally retained in SIS for about one-quarter of a second. It is not possible to consciously extend the time that sensory information is held in SIS. The function of SIS is to make it possible for the brain to work on processing a sensory event for longer than the duration of the event itself.

Short-Term Memory

Information passes from SIS into short-term memory, where again it is held for only a short period of time—a few seconds or minutes. Whereas SIS holds the complete image, STM stores only the interpretation of the image. If a sentence is spoken, SIS retains the sounds, while STM holds the words formed by these sounds.

Like SIS, short-term memory holds information temporarily, pending further processing. This processing includes judgments concerning meaning, relevance, and significance, as well as the mental actions necessary to integrate selected portions of the information into long-term

30. Memory researchers do not employ uniform terminology. Sensory information storage is also known as sensory register, sensory store, and eidetic and echoic memory. Short- and long-term memory are also referred to as primary and secondary memory. A variety of other terms are in use as well. I have adopted the terminology used by Peter H. Lindsay and Donald A. Norman in their text on *Human Information Processing* (New York: Academic Press, 1977). This entire chapter draws heavily from Chapters 8 through 11 of the Lindsay and Norman book.

al devices include techniques for structuring information, challenging assumptions, and exploring alternative interpretations.

The following passage from Heuer's 1980 article entitled "Perception: Why Can't We See What Is There to be Seen?" shows that his ideas were similar to or compatible with MacEachin's concepts of linchpin analysis.

Given the difficulties inherent in the human processing of complex information, a prudent management system should:

• Encourage products that (a) clearly delineate their assumptions and chains of inference and (b) specify the degree and source of the uncertainty involved in the conclusions.

• Emphasize procedures that expose and elaborate alternative points of view—analytic debates, devil's advocates, interdisciplinary brainstorming, competitive analysis, intra-office peer review of production, and elicitation of outside expertise.

Heuer emphasizes both the value and the dangers of *mental models*, or *mind-sets*. In the book's opening chapter, entitled "Thinking About Thinking," he notes that:

[Analysts] construct their own version of "reality" on the basis of information provided by the senses, but this sensory input is mediated by complex mental processes that determine which information is attended to, how it is organized, and the meaning attributed to it. What people perceive, how readily they perceive it, and how they process this information after receiving it are all strongly influenced by past experience, education, cultural values, role requirements, and organizational norms, as well as by the specifics of the information received.

This process may be visualized as perceiving the world through a lens or screen that channels and focuses and thereby may distort the images that are seen. To achieve the clearest possible image . . . analysts need more than information . . . They also