Part I
Conclusion

We have come to the end of Part I where we set out to investigate, describe, and begin to explain the exceptionality of human consciousness—how we experience the world and our place in the world, and how we think about this experience. We structured our investigation on Merlin Donald's 4-phase theory of the evolution of the human mind, from the Episodic to the Mimetic to the Mythic and to our present-day Theoretic Mind. These four phases of the evolution of human consciousness remain "like an onion" (Donald (1991, p. 141), as vestige layers of our consciousness today, shown in Fig. 1. Together these four evolutionary layers determine how human consciousness frames our perspective on the world and our place in that world, defining what we think about and how we think.

It is a remarkable story, our evolutionary development. Humans started out in the Episodic Mind phase as just another animal species. But there was something different about them. Like other species, they framed their experiences of the world in units of the episode, then stored these episodes in a form of episodic memory—the memory of experience. Perhaps our episodic memory was always unique; or perhaps, somewhere along the way, human episodic memory evolved differently than other species, pushing humans far ahead in evolutionary terms. In Part I, we have placed the "seed" of human uniqueness in how we store our experiences in episodic memory: we are uniquely aware that the memory is in the past (Chronesthesia, in Fig. 1), that we are reexperiencing the past when we recall it from memory (Autonoesis), and that the experience and the memory of it is uniquely the individual's and hers alone (Self). From this seed, everything else that contributed to our unique consciousness arose over the hundreds of thousands of years of evolution. In any case, our consciousness is different from any other species. Exceptional.

We are now ready to operationally define human consciousness for the purpose of this book. It is a very rough definition, crude and steeped in the oil and fumes of our rapidly disappearing—to be replaced by AI and robots—petrol-based industrial age.
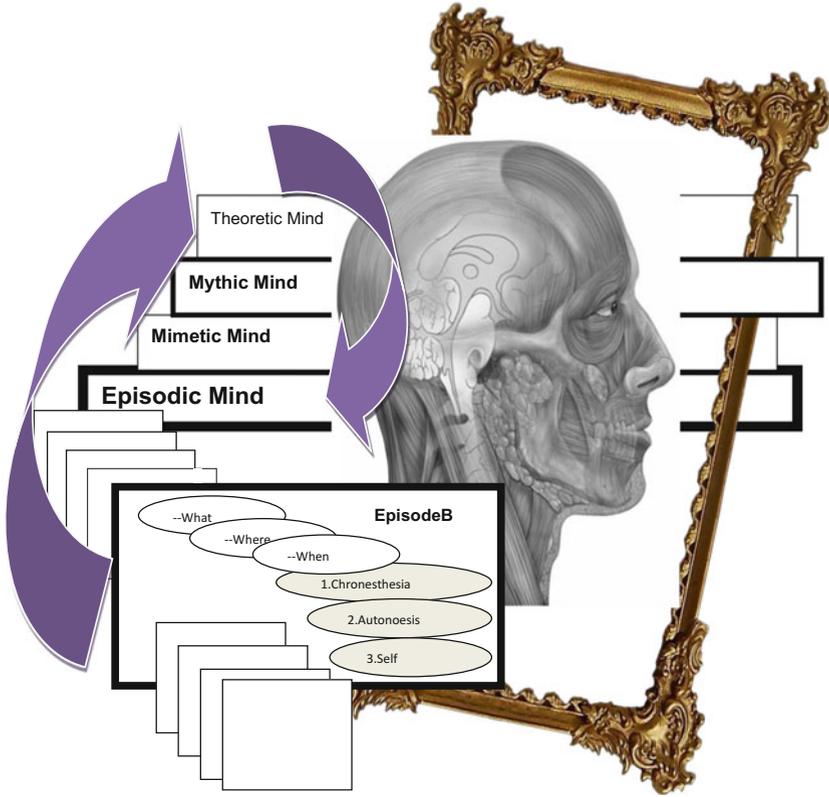
Fig. 1 Human consciousness framing what we see, based on Donald's 4-phase/levels theory

Definition of Consciousness: The Combustion Engine

In this book, we are interested in information need and information search from a broad human consciousness perspective. Here, we compare human consciousness to an internal combustion engine. We start with our base diagram of the structure of human consciousness—Donald's (1991) four layers: the Episodic Mind, the Mimetic Mind, the Mythic Mind, and the Theoretic Mind—shown in Fig. 1.

At the top of Fig. 1 are the four layers of our present-day consciousness; at the bottom of figure is Endel Tulving's three-aspect theory of episodic memory. The Tulving theory is a very dynamic conception of this vital part of our consciousness—the interface vehicle or channel between what is outside us in the world and what is inside us. Within this episodic memory are the engine's

- Pistons, and the
- Sparkplug that ignites the combustion process when human consciousness comes into contact with the outside world.

In addition, as the subject of this book is information need, we consider the individual's intention in searching for information, which is the engine's

• Fuel.

We will discuss each of these in turn in the following sections.

Pistons

The essence of Tulving's theory is that humans engage in time-travel to a past episode via its storage in episodic memory. More important, humans can also time-travel to the future, manipulating the stored memory of the episode as a rehearsal or planning device for a future episode experience.

Time-travel seems so bizarre an idea, but if you think about it we really do go back in time through our episodic memory system to relive, reenact, at the very least mimic an episode we have just experienced, or even experienced many years before. In telling your spouse about your day, we are accessing episodic memory and mimicking the episode out loud. We often exaggerate such stories, especially with the years. So we often mentally manipulate the episode memory, look at it from different angles, even change the episode's scenario or narrative.

Future time-travel seems even odder an idea until we think about it. The future, again, is accessed through the past episode representation stored in our episodic memory. Via these already experienced episodes, we extrapolate, using them as mental rehearsals for future episode experiences. We do these rehearsal scenarios in our head almost as a matter of course: for an upcoming birthday; and even making a list of items when we go to the grocery store, aren't we in a certain sense rehearsing a future episode of our experience?

If we take an overview of it, mental time-travel backward and forward is done through each of Donald's four layers of consciousness, starting from a past memory stored in episodic memory, as in the following:

Time-travel to the past:

1. Episodic Mind layer: The individual mentally time-travels to a past experienced episode stored in memory.

   a. Mimetic Mind layer: The individual mentally mimics this past experienced episode to herself and to others in the group.

      • Mythic Mind layer: The individual projects a past experienced episode as an existential experience, for example, a religious experience of a real or imagined conversation with some religious figure.

         Theoretic Mind layer: The individual mentally returns to an episode of a scientific experiment gone wrong, in order to figure out what went wrong. In the social sciences, the researcher may interview subjects

and return to these interviews by mentally time-traveling back to the interview situation.

Time-travel to the future:

1. Episodic Mind layer: The individual mentally accesses a previously experienced episode as a rehearsal for a future experience with the same or similar episode. Going to the dentist's office, for example, everything seems familiar when we walk in.

   a. Mimetic Mind layer: For a projected future encounter with the same or a similar episode, the individual mentally mimics or reenacts possible scenarios, particularly if the future episode is important. There are awareness levels for this mimicking. The less important a future episode is, the less we are aware of mimicking it before it happens.

      • Mythic Mind layer: The individual mentally projects his or her ascendance to heaven after death.

         Theoretic Mind layer: The scientist mentally time-travels to the future to control the future, for example, the scientist Leeuwenhoek planning and prepping the bacteria sample for a future experiment.

Time-traveling both backward and forward, and by interweaving between Donald's four layers, forms the engine's up-and-down moving pistons that drive our consciousness. To give a partial impression only, in Fig. 2 we diagram with a winged-figure this two-pronged time-traveling, in-between the four layers, and backward and forward in time.

But the interweaving between the four layers, and backward and forward in time, is the least of what constitutes the pistons in the consciousness engine. There is much more mental backward and forward time-traveling driving the piston action of the consciousness engine.

Remember, even future mental time-travel involves first accessing a past memory episode from episodic memory. Mentally time-traveling backward and using the episode as a frame or schema for what we are to do next is a matter of our everyday existence, for everything we are about to do. We are constantly, in fact, traveling back in time, picking up an appropriate episode memory, then using that memory to predict and guide us in the action we are about to carry out, however trivial. Entering a new room, for example, because it is so common an episode, so trivial, it is almost automatic—without our awareness. We travel back to a room frame stored in episodic memory and then utilize this room frame before we open the door to enter the new room. As we are physically moving around the room, we are still using this frame. So the past episode frame is also, and almost simultaneously, a future representation as well, of what we are about to do on an almost constant basis. In fact, one could say that we almost constantly "live" in the future. And for a normal, everyday intersection with the world, we don't in fact experience these episode experiences in the present, or at least the "present" in these episodes is very minimal. We are on autopilot.
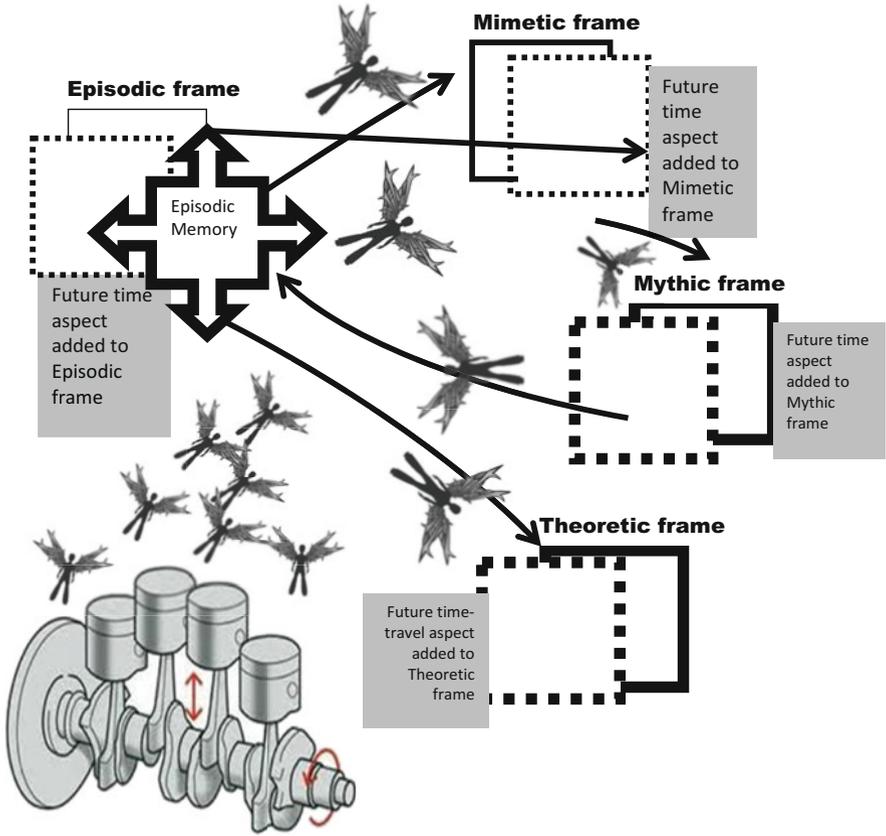
Fig. 2 Human consciousness compared to an internal combustion engine, starting with the pistons of the consciousness engine in the lower left-hand corner of the figure

Part II goes much more into this future time-travel fact of our consciousness. The point we wish to make here is that this constant backward and forward traveling in time is a fact of our consciousness. It is how we frame the ongoing world in real time, *as we are experiencing or intersecting with it.* It is the constant up and down of pistons in a car engine—the driving force in human consciousness.

But for the moment, let's move on to the second major point we wish to emphasize in this Part I Conclusion, which is the combustion that occurs in human consciousness that keeps the pistons going up and down. Its intensity and strength is so much greater than in any other species that it is different in nature.

SparkPlug and Combustion

We have seen in Chap. 4 that the human ability to mentally time-travel back to a previously experienced episode, via our memory system, can also be done by intelligent animals like the scrub jays. But humans do this mental time-travel differently, not simply quantitatively different but qualitatively different in its nature than all other species. What makes this difference?

Endel Tulving describes three aspects of episodic memory that together constitute the uniqueness of human consciousness: (1) Chronesthesia: the "when" of the experienced episode; (2) Autonoesis: awareness that the memory recalled from episodic memory is being reconstructed by the individual and is different from her real-time perception of the ongoing world; (3) Self: awareness that the memory being reconstructed is her own memory of her intersection of the world in the unit of an episode, and hers alone, and that she therefore has proprietary ownership of this memory.

These three aspects of human episodic memory are incendiary, creating combustion; they form the sparkplug—the transferring device—that allows the transfer of information from the outside world inside us into human consciousness. This intense ownership of the human intersection with the world is exceptional among species, in terms of

1. Time:

- Humans can reframe time by reconstructing their intersection with the world, moving it back and forth in a time continuum, even to "before birth and after death." (Suddendorf and Corballis 2007, p. 301)

2. Space:

- Humans can reframe "far space as near space" inside their own heads (Berti and Frassinetti 2000, p. 415; see also, Malafouris 2009, p. 97)

A corollary of this exceptional human ownership of their intersection with the world is ownership of and thus permission to mentally objectify the intersection, via the experienced episode stored in episodic memory, and ultimately to objectify the world itself. It is this object-making quality to the episode intersection that creates the unique and spectacular combustibility agent between humans and the world.

The evolutionary development of the human brain through Donald's four phases describes an ever-increasing intensification of this human ownership of their intersection with the world. With the development of writing in the Theoretic Mind, man's objectification of the world in knowledge symbols and equations, in theories, models and algorithms, on the Internet and in books and articles, has dramatically intensified the sense of proprietorship given to us by the representation of our intersection with the world in episodic memory, and by corollary extension the world itself, and on both an individual and on a species level. This is the essence of human exceptionality as a species, and the foundation of our unique and special consciousness. For good and for bad!

Now for the fuel fueling this intense combustibility, which is information need and the subject of this book.

Fuel

The fuel of the engine of human consciousness is the search for self-recognition of the Episodic Mind layer, the search for understanding of the Mimetic Mind layer, and then the more powerful time-travel machine: the search for meaning of the Mythic Mind layer. These describe the intentions underlying why humans travel back in time to reenact an experienced episode. The understanding intention was the seed forcing the developmental transition to the Mimetic Mind phase of human brain evolution. The search for meaning was a more powerful fuel fueling a more powerful Mythic Mind time-machine.

The transition from the linear to the paradigmatic way of thinking, which provided the seed for the transition to the new consciousness in the Mythic Mind phase, was, according to Donald (1991), the pivotal step in human evolution, the one that turned us into cognitively modern humans and separated us for good from our closest cousin species the Neanderthals. This new paradigmatic consciousness, in turn, enabled the third and so far last transition to the Theoretic Mind. In Part I, however, we take the odd position that the essence of the Theoretic Mind is the search for understanding the world, frequently with technological enhancement, not the search for meaning. Yet, the search for meaning intention is the more powerful fuel for the backward and forward of our consciousness engine's time-traveling pistons—a fine distinction that forms the thesis of this book, which we fully articulate in Part III.

There it is—a rough definition of consciousness. But however flawed it may be, it provides us with an operational definition of consciousness that is extremely useful for our purposes.

Consciousness-Based Information Search

We end Part I with the extremely practical objective of this book, which is that information search systems should be designed taking a consciousness-based perspective. Now they obey a narrow interpretation of Popper's 3-World vision of knowledge construction, shown in Fig. 3a. According to this narrow interpretation of Popper, the central interaction of information search is the interaction between the individual searcher's grasping for understanding (World 2) of elements in the objective knowledge store (World 3). The searcher then only goes back to World 1, the world of the material-physical, social and human episodic experience events, to refute or confirm the theories, models, and hypotheses of the searcher.
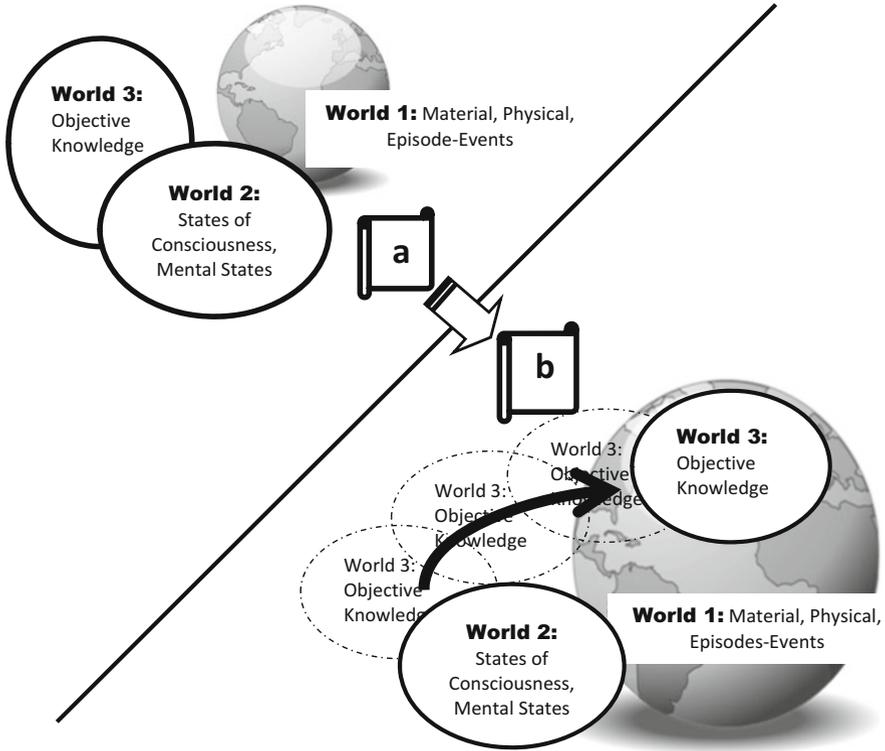
Fig. 3 The switch in paradigm frame in information search, from (**a**) a focus on the interaction between Popper's World 3 and World 2, to (**b**) World 3 merging into World 1 resulting in information search as the experiencing of an episode

This is a transactional focus on the transfer of information between the knowledge store in World 3 and the mental states, human consciousness, and grasping at understanding in World 2. In other words, the information search transaction is shifted away from World 1, the real world itself—the world of the physical and material world, and most importantly, the world of human experiencing in the world.

A consciousness-based search system, on the other hand, switches the focus of information system design to facilitating information transfer between World 1, the physical and material world, and the world of experiencing episode events, and World 2, the world of human consciousness and mental states. With a consciousness-based vision, World 3 becomes part of World 1, and new knowledge production is viewed through the lens of the searcher experiencing an episode in life, as shown in Fig. 3b.

Information search in this new paradigm is now an episode of the searcher's experiencing of the world, and therefore part of the intention structure of human consciousness. So a search engine based on this consciousness perspective will build into its design how and why humans as a species intersect with the outside world of

information. There are layers of consciousness so there are layers of different intentions. It is how we frame the world, our place in that world, and the nature of the information need intention that drives us to search for information. The two dominant intentions are the search for understanding and the more powerful search for meaning. The two are linked, as we will investigate in Part III. But we must first deal, in Part II, with the central problem of information search for new knowledge construction due to our exceptional consciousness.