Learning from Memory

Learning from Memory: Body, Memory and Technology in a Globalizing World

Edited by

Bianca Maria Pirani

CAMBRIDGE SCHOLARS

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PREFACE

ROBERTO CIPRIANI

This volume is an important reference point in our field, addressing, as it does, three themes of vital importance to contemporary life (the body, memory and technology) and because it does so from a perspective which, some time ago, Roland Robertson aptly defined globalised. The topics and contents are of the utmost relevance because, in some cases, they anticipate future developments, which, at present stand half way between modernisation and virtuality, between continuity and innovation, between old and new frontiers.

The question underscoring the various articles (addressed to the discerning reader and the sociologist who wishes to go beyond the already consolidated) concern yet again the role of the social actor, faced not only with the problems of everyday life but also with the meta-generational dynamics involving our descendants.

What will happen, at planetary-market level, to the adolescents of today who invest in their future as protagonists, to the social and cultural structures of this new-born century, to currently accepted attitudes and patterns of behaviour, to individual and collective memory, to the physical self endowed already with all kinds of prostheses (from pacemakers to i-pods, from hand-held phones to personal electronic devices, myriad tiny supports, a part of the daily apparel we don as soon as we wake)?

This is no minor challenge. Are we slaves to the structures handed down to us by those who went before, designing our scenario, the kind of life, that is, we are obliged to experience, the conditions shaping our existence and survival? Or is there still some room for personal freedom, for the possibility to create an environment of one's own? Or is one obliged to opt for halfway measures to be found somewhere between upstream conditioning and downstream potential?

Within a similar scenario – where even capitalism is an unrecognisable, fleeting, polymorphous, invisible, anonymous, elusive, continuous flow chart devoid of clear outlines, which our person is obliged to deal with – what can our physical self expect? And what use can me make of the memory that belongs to us?

The editor of the book recalls, and rightly so, that "the 'passage' from biological to cultural, suggested by present day cyber-sociality, obliges us to 'rewrite the codes' both of the body and of the orientation system, in this computer society of ours. Information technology (ICTs) is changing the way people relate to and interact with each other and the objects surrounding them. The emergence of complex, compound, contemporary technologies involving virtuality, simulation and computer modelling (including tomography) has special implications for embodiment and perception. Technologies, inventions of the human brain, have, obviously, an immense impact upon the functioning of the brain, on the workings of the mind and on memory".

Furthermore, "the focus of technology is gradually shifting from the computer as such, to the user. Electronic communications – personal computers linked together by Internet – create a worldwide web of memory banks".

Given these premises, the present volume appears extremely promising, even provoking. Each chapter deals with a domain where acquired and new knowledge meet to be contrasted and compared, for the enhancement of scientific knowledge.

The common interpretative key to the various approaches represented here, is, perhaps, the notion of time: time can actually devour everything; time can reach beyond what has already been; time can remove itself from the past for good, without turning back. It grinds event after event, returning each one to the bowels of the earth from which it stemmed, condemning it to oblivion, to the river Lethe, that is, to forgetfulness. But above all, time is, by its very nature, un-stoppable. The very moment one tries to trace it, time escapes and seems to elude our clumsy efforts to block it. To be even more precise, the real attitude of time seems to be that of total indifference towards what it leaves in its wake.

But memory comes to the rescue and recuperates what times risks annihilating. So, not even the physical dimension is thwarted; to the contrary, it is reappraised thanks to memory and, more and more, thanks also to new technological devices (although there are doubts regarding their resistance in time: technical supports are still not totally trustworthy, their duration in time has not been scientifically tested and there are grave risks of sudden failure).

From another point of view, we see how increasingly fixable, modifiable, adaptable the body has become. Prostheses replace missing or malfunctioning parts. The *soma* can, therefore, be reprogrammed. Even death can be delayed, at least partially, thanks to intubation, life-support machines, oxygen supplies. The issue of "delayed death" has been

eloquently illustrated thanks to the cases of illustrious personages like the Spanish dictator Francisco Franco and the Brazilian politician Tancredi Neves.

On the moral plane, however, questions concerning eugenics and euthanasia arise, that is, questions accruing to life and death, as focal aspects of the endless existential pathway. But the horizons also broaden to embrace less vital issues like cosmetics, diet, plastic surgery and ultraviolet sun beds for tanning out of season, as well as tattoos, piercing and mutilation.

One must also recognise the fact that contemporary society seems to have reached the acme of the glorification of the body. New aesthetic and reparatory surgery, neo-genetics, neo-dietetics and neo-beauty have all contributed to building an imposing, majestic monument to the ideology of wellbeing. Meanwhile alternative solutions providing relief and undue development of the body industry are being studied: the issues of abortion and contraception are now believed to have been superseded by questions like cloning, same-sex marriage, gene banks, artificial fecundation, modification of embryos.

Medicalisation has gone beyond bounds. The body is now considered a somewhat unique economic commodity, sold in parts for transplants, loaned to supply spinal marrow (at times even procreated for medical purposes). In actual fact, the body is becoming more and more a product among products, equally tradable. And although the body remains exclusively ours, nevertheless it seems to be giving rise to a new kind of capitalism, of private ownership of the physical self (with pricelists referred to single organs, a new butcher's shop window displaying human meat with its catalogue of prices and costs, like an insurance policy containing compensation-rates tables). The aim seems to be that of preserving as many individuals as possible of those no longer able to reproduce because of age. The quest for wellbeing at all costs continues unrelentingly.

INTRODUCTION

BIANCA MARIA PIRANI AND IVAN VARGA

1. Memory in the Real World

This book with contributions from international social scientists– presented at the program of Research Committee 54, "The Body in the Social Sciences" of the International Sociological Association's XVII. World Congress (Gothenburg, Sweden, 11–17 July, 2010) – focuses on the link between body and memory, with specific references to the use of computer technologies.

For neuroscientists it is a known fact that human beings automatically and unconsciously organize their experience in their bodies into spatial units the confines of which are established by changes in location, temporality and the interactive elements that determine it. Our memories might be less reliable than those of the average computer, but they are just as capacious, much more flexible and more user friendly. According to the current collective interactive elements enterprise of cognitive neuroscience – the systematic emphasis on the temporal dynamics of the neural networks that underlie learning – we consider the body as a spearhead of the social sciences, above all concerning the processes of memory.

For most people *memory* does not sound like a mysterious concept. In fact, the general public is often using the concept inclusively, thus meaninglessly, indiscriminately referring to all aspects of the mind. Ask ten people, what memory does, and the answers would be pretty uniform: learning names, telephone numbers, the multiplication table, and recalling for the final exam the dates of historical events one could do without. Memory is also among the most heavily studied aspects of the mind. In a typical study of the memory the subject is asked to memorize a list of words or a series of pictures of faces and then to recall or recognize the material under various conditions. However, both the perceptions of memory by the general public as well as the traditional ways of conducting research into memory have very little to do with the way memory operates in real life. In most real life situations we store and recall information as a prerequisite for solving a problem at hand. Here, recall is a means to an

end, not the end itself. Furthermore, certain memories are accessed and retrieved not in response to an external command coming from someone else but rather in response to an internally generated need. Instead of being told, what to recall, I have to decide which information is useful to me in the context of my ongoing activities at the moment.

The kind of things people remember in everyday life include a great variety of different items such as, for example, remembering a shopping list or a recipe, remembering to telephone a relative or to fill up the car with petrol, recounting the arguments put forward at a meeting or the plot of a play seen on television, or remembering the amount of a bill that has to be paid. All these experiences are embedded in a rich context of ongoing events and scenes; they are influenced by a lifetime of past experiences, by history and culture, by current motives and emotions, by intelligence and personality traits, by future goals and plans. It is probably impossible to take all these factors into account, but everyday memory research does recognize the importance of the context in which an event occurs. The kind of things researchers exploit the way that reinstating the context can facilitate retrieval. Research into everyday memory also emphasizes the fact that remembering usually occurs in a social context. Most real life acts of memory recall involve deciding, what type of information is useful to us at the moment and then selecting that information from the totality of the available knowledge. People remember details of an event they witnessed when they are reminded of aspects of the context such as the scene, or the preceding or succeeding events. Memory is not just a private databank; it is shared, exchanged, constructed, revised, and elaborated in all our social interactions.

Memory in the real world (Cohen, 2008:1-20) is often known as *everyday memory*; it is concerned with the memory used as people go about their daily lives. Research puts its emphasis on the functional aspect of memory. Memory, then, is viewed as part of a repertoire of behaviour designed to fulfill specific goals. For example, autobiographical memory functions in order to build and maintain personal identity and concept of the self; prospective memory functions to enable the individual to realise plans and intentions; spatial memory functions so that the individual could navigate in the environment, etc., etc. Bruce (1985) stated that research into ecological memory must ask, how memory operates in everyday life, identifying causes and processes; what functions does it serve and why has it evolved both ontogenetically and evolutionarily in this way. Everyday memory is *context-bound* and not context-free.

Today, memory is conceived as a complex and diffuse mental faculty which does not reconstruct the past faithfully, but instead is responsible for

a continuing process producing individual memories that depends on the meaning ascribed and the emotions linked to the embodied experiences of the individual. This is true above all when the events are important for one's sense of self (autobiographical memory), in conferring uniqueness to one's own life (Schacter 2001). Thus, we can state that the approach that is currently dominant in memory studies is "constructivist in nature" (Assmann A. : 2006), and that it has been supported by the evolution that has taken place in the neurosciences themselves, although substantial differences can be found when comparing the subjective and social levels of memory.

Memory takes many forms.

• Representations and reconstructions of the past, including autobiographical memories.

• Socially distributed and reconstructed memories, such as jointly reconstructed autobiographical memories.

• Collective memory, ranging from the stories a family tells about itself on family occasions to the culture of the past, including religious stories and myths, communal histories, and socially celebrated events and persons.

• And finally there is also memory so ancient that it is stored in our physiology and our genes, adaptations preserved by evolution as patterns in our behaviour and in the structure of our social networks, patterns that have augmented the adaptive fitness of our species. The chapters in this book will bring together reflections, by contributors from several research traditions, on the connections between electronic technologies and memory in all of these forms.

The first section of the book "Memory and the Enhanced Body", consists of contributions describing computer implementations to solve spatial problems, to simulate human or animal orientation and navigation behaviour, or to reproduce spatial communication patterns. The second section, "The Social Nature of the Body: Synchronization, Embodimemt and Technology", is an experimental performance aimed at fleshing out the *body in context* as a methodological standpoint for examining how the sense of our bodies, of our orientation in the world, and our everyday memory interact with information technologies. Each chapter brings together reflections by contributors from several research traditions on the connections between body, memory and electronic technologies. Contemporary understanding of these connections necessarily spans research in many disciplines, ranging from the social sciences to cognitive science, psychology, neuroscience and biology. We shall slight none of these perspectives, yet we propose a sociological analysis which benefits

from recent advances in the study of social networks. In addition, we wish to link network analysis to emerging knowledge of synchronization in attachment behaviour and social interaction. We believe that an account at the sociological level will prove valuable in throwing light on accounts of human behaviour at the interpersonal and social level, and will play an important role in our ability to understand the neurobiological factors that underpin the various types of memory.

Research on social networks has taught the social sciences why so many of their canonical questions have seemed intractable using only traditional theoretical tools. Any list of the topics to which network research has given new understanding is impressive—the organization of economic markets, the spread of obesity, the sexual organization of cities, the structure of adolescents' friendship choices, health and recovery from illness, loneliness and the supports for happiness, the network advantages of brokerage and closure, constraints on reciprocity and altruism, patterns of entrepreneurial behavior, the organization of production networks, the structure of professional élite systems, rules governing the choice of sexual partners, the synchronization of religious communicants, moral integration, and many other topics. All are subjects that network research has opened up in new and productive ways.

What of memory and the body?

2. The Body Memory and Spatial Cognition

The starting point of the book is the hypothesis that the body is a spatial-temporal carrier of socially distributed processes that enable people, through links with others in social networks, to acquire, store, recall and manipulate information. It is common to characterize cognitive tasks in terms of "networks" of underlying brain structures derived by fMRI or other neuroimagining methods. These considerations imply that these "networks" change over time. Thus, it is impossible to characterize a task by assuming a single, static network. Often the data are averaged across the whole experimental sequence on the assumption that the underlying neural network is static. This is a big mistake, since the network is usually not static, and averaging across the whole sequence is like mixing data points representing different populations. Therefore one would be better served by segmenting the experimental sequence and averaging the data separately within each segment, thus expressing the findings as a *vector*, rather than a single state. One can design a suite of tasks activating cognition that would elicit the temporal dynamics of such spatial networks as a function of learning. The present book suggests this

methodological approach because it is supposed to be more powerful in characterizing normal cognition, since a *vector* by definition contains more information than a single variable.

The spatial aspect of the body cannot be reduced to intersubjectivity only. Up until now the analyses have this in common: they treat the body as a "thematic object".

Up to this point, we have concentrated on the 'zero-point' of orientation as such, how it can be identified in various perceptual formations.

Research on spatial cognition is a rapidly evolving interdisciplinary approach to the study of cognitive spatial processes, be they real or abstract, originated by humans or machines. Without understanding human spatial cognition, we will not be capable to develop appropriate technology and interfaces for spatial information systems that communicate with humans by language and graphics in natural ways. Autonomous robots moving in an unknown environment require abilities to infer location of objects from incomplete and qualitative information from various sources and to follow imprecise instructions much like human beings. To use maps and other diagrams for communication with computers, we must understand, how people generate and interpret them. To fully exploit the potential of the technology of virtual reality, we must adapt its capabilities to human conceptions of space. In order to develop computers programmed by spatial structures rather than by sequential instructions, we have to fully understand the relevant aspects of space.

It is important to take into account the ways the body and objects relate to each other in the contemporary world that also change the old boundaries between the human subject and the material object. The world of the subjects and the world of the objects become increasingly intertwined.

Let us now turn to an examination of how the brain came to embed the properties of the external world, how it carries this out, and the evolutionary relationship of this phenomenon to the generation of such an amazing functional space as mindness. What we must stress here is that the brain's understanding of anything, whether factual or abstract, arises from the manipulations of the external world, by our moving within the world and thus from our sensory-derived experience of it. According to LLinas (2002: 59), "*the organization and function of our brains are based on the embedding of motricity over evolution*".

When we ponder the concepts of learning and memory, what seems most often to come to mind are the wonders of human capability. The immense amount of knowledge some people acquire from years of education, or the ability to recall a singular event from one's childhood decades later, as clearly as if one were living again, is what generally

comes to mind when thinking of human memory. But one should keep in mind that the neuronal mechanisms subserving these fantastic capacities came to us, as do all things physiological, by the long evolutionary processes of trial and error. For our nervous systems,–for us– to be able to learn and to remember means that the evolution not only had to learn and remember, but that it had to learn and remember *how* to learn and to remember. What we, or any creature may learn, however, is a product of the myriad needs and events experienced during development. It was evolution's task to learn and slowly fine-tune the appropriate forms, the structural morphologies that added to the survivability of a given species. By so doing, it brought together the world of our external bodies with our brains. The result was the opposable thumb, the tail of a rat, the nose of a kitten, even the shape of the brain. This kind of memory would be considered *phylogenetic.* But the phylogenetic memory of structural forms that expresses itself at birth is not enough. We see interwined into the organ architecture (the plant) a second type of memory, as phylogenetically old. At this period in neuroscience, the issue of learning and memory are central. Indeed, the ability to learn is viewed as critical for bettering ourselves within the practical world in which we live.

Somatic sensibility arises from information provided by a variety of receptors distributed throughout the body. Somatic sensibility has four major modalities: *discriminative touch* (required to recognize the size, shape and texture of objects as well as their movement across the skin); *proprioception* (the sense of static position and movements of the limbs and the body); *nociception* (the signaling of tissue damage or chemical irritation, typically perceived as pain or itch) and *temperature sense* (warmth and cold). Each of these modalities are mediated by a distinct system of receptors and pathways to the brain. However, all share a common class of sensory neurons: the dorsal ganglion neurons. The somatic sensory stimuli we encounter in everyday life are complex, they cover large areas of the skin and have many characteristics. Each type of receptor is selectively activated by distinct spatial and qualitative properties of a stimulus. Different types of information about an object are transmitted by populations of different types of sensory neurons and conveyed in parallel pathways to the primary somato-sensory cortex where all the information is combined into a unified somatic percept. Our sensory systems are the way in which we perceive the external world, remain alert, form a body image and regulate our movements, Sensations occur when external stimuli interact with receptors. Sensory information is transmitted to the brain as trains of action potentials travelling along individual sensory neurons and by agglomerations of such neurons acting together.

The location and space of a stimulus are conveyed topographically, through each activated receptor's position in the sensory epithelium, called its receptive field. The complex qualities of sounds, visual images, shapes, textures, tastes and odours require the activation of large ensembles of receptors acting in parallel, each one signaling the attribute of a particular stimulus. For us to savour the richness and diversity of perception, the central nervous system must integrate the activity of an entire sensory ensemble.

The goal of the neuroscience is to understand the mind – how we perceive, move, think and remember. Molecular biology also has greatly expanded our understanding of how the brain develops and how it generates behaviour. In addition, the ability to develop genetically modified mice allowed us to relate single genes to signalling in nerve cells and to relate both of these to an organism's behaviour. Ultimately, these experiments will make it possible to study emotion, perception, learning, memory at both a cellular and molecular level.

Memory is not an exclusive property of *Homo sapiens*. However, human beings differ from animals inasmuch as their individual memory is influenced by – one could even state, dependent on – collective memory. The Freudian theory of psychoanalysis emphasized the role of instincts and drives in the foundation of the unconscious. Jung pointed out the importance of innate patterns of behaviour. In this aspect the ethology of Lorenz is similar, inasmuch as he also emphasizes the importance of innate patterns of behaviour amongst animals. (This, and some other examples, are derived from the article of Soren R. Ekstrom [2004] "The mind beyond our immediate awareness: Freudian, Jungian and cognitive models of the consciousness"). The early discoveries of Freud linked the unconscious to repressed memories, mainly about childhood sexual traumas. Jung's emphasis on archetypical factors, such as myths and beliefs, indicated that he assumed the existence of a common human constitution that is independent of historical conditions. It is, however, highly questionable whether certain similarities in, say, creation myths, etc., result from genetic predispositions. Ekstrom (2004) to the relatively new cognitive science and the works of George Lakoff and Mark Johnson, two cognitive linguists and philosophers who introduced a new approach to the unconscious in their attempt at overcoming the dualist conception of the body-mind relationship. The gist of threir argument is that the unconscious is operating beneath the level of cognitive awareness, thus doeIs not stem from repression in the Freudian sense. It has two areas: "The first has to do with all our automatic cognitive operations: visual and auditory processing, and motor operation among them. The other,

particularly relevant when we deal with memory, is what they call ‘our implicit memory’ and they claim that ‘all our knowledge and beliefs are framed in terms of a conceptual system that resides mostly in the cognitive unconscious” (Ekstrom, ibid.: 666). Highly complex computer simulations allow to conclude that the brain carries out two things at the same time: perception or motor control on the one hand, and conceptualizing, categorizing and reasoning, on the other. (Ibid.: 667). They conclude that humans’ concepts relate to spatial-relations concepts, concepts of bodily movements and concepts indicating the structure of actions or events. What is highly important for our purposes, i.e. to understand and analyze the spatial aspects of the body’s existence, these findings confirm the capacity of the brain to conceptualize the forms of our bodily existence.

Advances in artificial intelligence (AI) to simulate certain tasks performed by the brain rely on neural modelling. They are also relevant for rethinking the nature of the unconscious as well as of the mechanisms of memory. Roger Schank (1995: 669–70) of Northwestern University developed the theory that a wide range of stories or scripts serve in memory storage. They help to remember a great number of events and can be “indexed”. These mechanisms ensure that many cognitive operations happen without our conscious participation. According to this theory knowledge has many features but only some of them are conscious. “There is the rational knowledge of acts necessary for logical thinking, and there is the emotional knowledge of being able to identify how we feel. But beyond these two, there is also […] subconscious knowledge of which we are ordinarily unaware of and a physical knowledge that our body uses which is mostly unconscious. Finally, Schank assumes a non conscious knowledge which is being used in basic and ongoing mental activity. We are generally unable to articulate this activity as it occurs to us, but it can now be deduced from computer modelling.” http://www.rogerschank.com

In modern times it was Maurice Halbwachs (1877–1945), the French sociologist belonging to the Durkheimian school, who first elaborated the characteristic features of collective memory. Already Durkheim (1912) mentioned the importance of the collectivity on laying the frameworks for the ideas that influence the individual’s thinking of the past. Halbwachs, however, developed further the concept of collective memory. He claimed that the study of memory does not take into account the properties of the subjective, i.e. the individual, mind. Instead, memory is the result of minds working together in society and their operations are structured by social arrangements. He wrote (1912:38) “it is in society that people normally acquire their memories. It is also in society that they recall, recognize, and localize their memories”. Halbwachs made a distinction amongst

autobiographical memory, historical memory and collective memory. This distinction has its roots in Bergson's differentiation between memory of specific events and memory of enduring attitudes. Namely, Halbwachs analyzed the dreams and images of memory, the relationship between memory and language, the location of memories as well as the collective memory of the family and the religious collective memory. He also called the attention to the influence of the social classes and their traditions in building and maintaining collective memory. He considered that the social frameworks of memory include the temporal and the spatial frames, language and the dominant mode of thought. The temporal frame of memory relates to the historical process and to the actual social conditions within which the historical events are recalled or (re-)evaluated. The spatial framework refers to the position of the group in space. Objects, things, insisted Halbwachs, are parts of the society. Works of art and literature already suggest the social type or category of the human being or beings who are depicted or described. The group, say, the family, that is surrounded by a more or less stable and permanent surrounding (habitat, objects, etc.) develops an image of its external surroundings, the *milieu*. The individual experiences and evaluates it according to his/her belonging to the group. Buildings acquire meaning for the group, even if its members move elsewhere. (Namely, personal memories are intertwined with group memories, e.g. someone's memory of his/her university years are linked to memories of the university's physical and intellectual environment). Halbwachs attributes special importance to the city-space. It is structured according to functions (i.e. economic, entertainment, etc.) and customs. He also mentions that part parts of the city are distinct by social stratification: the streets inhabited by the rich are different from the ones where the poor live. (In the analysis of the city, its functions and stratification, Halbwachs anticipated and influenced Pierre Bourdieu's and his school's conceptions).An important element of Halbwachs' thought is the conception of the relation between the individual and the collective memory. Namely, the individual's memory is his/her own but as they are members of a group, they remember as group members. In other words, memories that the individual considers to be his/her own, are influenced, or even determined, by the collective memory, and change when the individual changes his/her relationship to other milieus.

Paul Ricoeur, in his monumental work, *Memory, History, Forgetting* (2004) acknowledges the seminal contribution of Halbwachs but complements it by introducing a phenomenological (as well as a hermeneutical-historical-epistemological approach to the subject and memory. His aim is to overcome the aporia that exists between the

sociology of collective memory and the phenomenology of individual memory. In the segment *"Three Subjects of the Attribution of Memories: Ego, Collectives, Close Relations"* (2006:124-132), Ricoeur, analyzing the role and nature of language, elaborates on the relations between personal and collective memory. He says that "memory enters into the region of language; memories spoken of, pronounced are already a kind of discourse that the subject engages in with herself. What is pronounced in this discourse occurs in the common language, most often in the mother tongue, which is the language of others (Ibid.:139). A phenomenology of social world, as developed by Alfred Schütz, bridges the gap between the individual's memory and the memory of the others. As the individual never lives isolated from others, his or her memories are first of all influenced by the people who are closest to him or her – members of immediate family – and vice versa, the individual's birth and death affects them. Thus, there is a certain gradation in belonging to a group, from the intimacy within the family where emotions influence memories, to the common interest as manifested, say, in memories shaped by class interests. Solidarity with, or within, a group shapes memories and assessment of the importance of events that constitute particular memories. The problem of generations also emerges in this context. Ricoeur (1990) , in the third volume of *Time and Narrative* (1990) refers to the anonymous relationship between contemporaries, predecessors and successors as developed by Schütz. Ricoeur, then, goes beyond the Heideggerian analysis of the aporia of temporality that exists between the public (calendar) time and the mortal time, i.e. the life span of the individual and his/her generation. He wrote: "The notion of a succession of generations provides an answer to this antinomy by designating the chain of historical agents as living people who come to the place of dead people. It is this replacement of the dead by the living that constitutes the notion of a succession of generations." (Ricoeur, 1998:109.)

The problem concerning generations is important in two main respects: it is a pivotal aspect of carrying forth traditions and introducing innovation. Sociological approaches, especially Karl Mannheim's analysis, expanded the biological criteria of generations by introducing a common element: thinking, feeling and acting in similar ways. One can say that events experienced by people belonging to the same, or close, age groups, have been or are influenced by experiences they had in common. For example, World War II, the Vietnam War, the Holocaust, etc, mean something different for those who survived it in their home countries or in the battlefield or for those who learned of it from books or from accounts of survivors. These insights – the meaning and importance of which could be

more deeply analysed from philosophical and sociological viewpoints – shed light to the importance of intersubjectivity and history in shaping collective and individual memory. The relationship to the past, be it an individual's to his/her own or a society's to its collective memory, is always shaped by the present. As Jacques LeGoff, (1992:54) the French historian wrote: "The study of social memory is one of the fundamental approaches to the problems of time and history, in relation to which memory is sometimes retreating, sometimes overflowing." (LeGoff, 1992:54.) With the arrival of written, in lieu of the oral, memory, the amount of preserved memories has immensely increased and has become independent of the individual's memory.

The arrival and expansion of computer generated and computer stored memory has in a significant way changed, how humans create, store and recall memory. One substantive difference is that memories of humans are unstable (depending on the individual's capacity of remembering and recalling), while the content of the computer memory remains stable and with a suitable programme can easily and quickly be recalled. Nevertheless, one has to bear in mind that the programming has been done by humans – applying their mind and body (hands) – and, as LeGoff remarks, "human memory preserves a large sector that cannot be reduced to 'information', and that, like all the forms of automatic memory that have appeared in the course of history, electronic memory is only an aid, a servant of memory and of human mind." (Ibid.: 92).

In human beings emotions can, and do, influence the capacity to recall memories and even their content. Collective memories involve assessments of past events as a society's influential forces define, evaluate them. Eviatar Zerubavel (2003:11) states that that memory is "patterned in a highly structured manner that both shapes and distorts what we actually come to mentally retain from the past" and "many of of these highly schematic mnemonic *patterns* are unmistakably social." (2003: 11). He argues that "human memory is our ability to mentally transform essentially unstructured series of events into seemingly coherent *historical narratives.*" Zerubavel concurs with most historians and sociologists who emphasize that past events are presented and evaluated according to historical situations, but adds that there are skriptlike *plotlines* in which we often remember (reconstruct) past events, "as we habitually reduce highly complex event sequences to inevitably simplistic, one-dimensional visions of the past." Instead, postmodern conditions foster the attitude of "presentism" (the expression used by Adam Schaff, the Polish philosopher) that diminishes the social and cultural frameworks in which social identity has been established. The element of *forgetting* already

indicates the possibility of selective or blocked memory. At the individual level psychoanalysis investigates into repressed and suppressed memories, and one could eventually reveal the reasons of those removed from conscious memories. A person's relationship to his or her past – acceptance, denial, selection, interpretation or re-interpretation – as well as bearing the consequences from it has an important moral element that influences the individual's relationship to a group, be it a family or another collective. Jeffrey Blustein (2008) in his book, *The Moral Demands of Memory* (2008), develops a complex philosophical, ethical approach to individual and collective memory. One of the most important moral demands for historians is to discern the truth of past events and overcome the distortions imposed by the present. Temporal factors have to be taken into account in giving an accurate rendering of the past. If there are survivors of recent past (as mentioned above, the Holocaust, World War II, etc., etc.) it is easier to evoke a correct picture of events. In dealing with the remote past – especially if there is no written testimony left – there is always the moral problem for historiography, sociology and anthropology to establish not only their course but also their meaning for the present or else, give a reasoned account, why are they unimportant for the living members of a community or society.

There is no doubt that a great deal of our learning is implicit, in the sense that we can learn skills without being able to reflect and report on precisely what we know. By memory, we usually mean our capability to remember certain events of our past, or to retain and retrieve data and knowledge. However, the phenomena of memory are by no means restricted to that. As Descartes already noted, the lute player must also have a memory in his hands in order to play with such a skill. He would certainly be lost should he try to remember the single movements which he once learned deliberately. Obviously, there is a memory of the body apart from conscious recollection. Through repetition and exercise a habit has developed. Long-trained patterns of movement and perception have been embodied as skills or faculties that we practice as a matter-of-course in our everyday life – the upright gait, the ability of speaking, reading, writing and the handling of instruments, such as a piano or a bicycle or a keyboard.

Already conceptualized in French philosophy (Maine de Biran, Ravaisson, Henri Bergson), this kind of memory has come to be rediscovered and explored as *implicit memory* in the last two decades. Research into amnesic patients who may still learn simple motor skills though unable to retain new explicit recollections has demonstrated the existence of multiple memory systems. Above all, there ought to be a distinction made

between the so-called declarative and implicit memory. Declarative or explicit memory contains single recollections or informations that may be reported and described; it may also be called a tacit "knowing that". In contrast, repeated situations or actions have melted into implicit memory, thus no more to be retrieved as single events. They have become a tacit "know-how", hardly to be verbalized – we would have some difficulty to describe, how to waltz. Thus, explicit recollection is directed from the present back towards the past; implicit memory, however, does not represent the past but *re-enacts* it in the course of the body's performance. What we have acquired as skills, habits and experience, has become what we are today; implicit knowledge is our *lived past*.

On the other hand, implicit memory is not a mere reflex programme realized by the body machine.

"Computer modelling helps to study the mind—brain connection. For example, the one carried out by Joseph LeDoux of New York University, focused on the neural aspects of emotions, in particular fear. He concluded that the importance of synaptic transmissions in brain function allows to demonstrate that the self is synaptic. Against the objections that such athesis ignores the psychological, social, moral, aesthetic or spiritual character of the self, LeDoux counters that his theory does not deny these features but asserts that the synaptic approach shows, how those features of the self are realized. (Ekstrom, 2004: 670).The importance of these discoveries is not only a more precise knowledge of the machanisms of the brain; it also sheds light on those processes that are not immediately available to consciousness.

We (our bodies) are performing functions of which we are not aware, such as "standard body maintenance like regulating heart rate, breathing rhythm, stomach contractions and posture; or many aspects of seeing, smelling, behaving, feeling, speaking, thinking, evaluating, judging, believing and imagining" (Ekstrom, *ibidem*). For LeDoux, synapsises hold the clues to the dilemma of nature versus nurture, genetics versus learning. Similarly, we become conscious of unconscious operations after the fact, when e.g. someone talks to us, we decode the sounds of words and the meaning of the sentence (phonology); assign meaning to the words (semantics); know the grammatical relations between words (syntax) and using our knowledge of the world (pragmatics). This distinct structure and functioning of the human brain has an important, unique impact on memory. The importance of these discoveries is not only a more precise knowledge of the mechanisms of the brain; it also sheds light on those processes that are not immediately available to consciousness. The study of brain circuits, combined with the focus on synaptic plasticity or learning

as well as use of computer models allow to better understand the processes and working of the brain, the body—mind and the conscious—unconscious relationship. It also helps to get a more nuanced notion of the temporal element of the body. Neurological studies are ever more clarifying processes of the brain including the mechanisms of memory. The brain changes not only when we lose information but also when we are exposed to to excessive activation – for example when we practice a skill, such as learning to play a musical instrument with year-in, year-out, hour-after-hour drills. When scientists mapped the areas that receive sensory information for the left hand of string musicians, they found that the area activated by sensory impressions is larger than that in non-players. They also found that the area activated on hearing piano notes is roughly 25 per cent larger in pianists than in non-musicians, and the pathways conducting motor impulses are different. Juggling is not something that many people do on a daily basis. But if we were to start practicing, we would markedly improve in just a few weeks. In other words, it is an activity that lends itself to the study of what happens in the brain when a specific activity is learned. One study (Draganski, Gaser, Bush. 2004, *Nature* 427: 311–12) examined the structure of the brain in a group of subjects before and after a three-months course in juggling. What the scientists found was that an area in the occipital lobe specializing in the perception of motion grew over this period, but three months after the training stopped it had shrunk and lost roughly half of the increase previously induced by training. In other words, as little as three months' activity or three months' passivity had an immediate effect on the structure of the brain. Norman Doidge's book, *The Brain That Changes Itself* (2007), describes cases when the human brain did change itself. The author, a psychoanalyst and researcher at Columbia University and University of Toronto, documents the plasticity of the brain. During his contacts with eminent brain scientists he learned that "the brain changed its very structure with each different activity it performed, perfecting its circuits so it was better suited to the task at hand. If certain 'parts' failed than other parts could sometimes take over." (Doidge, 2007: xiv-xv.) This elasticity – a fundamental property of the brain – is called "neuroplasticity", and it refutes the long-held idea that the brain is "hardwired".

Research into training-based brain plasticity, such as the mentioned study of musicians, seems to confirm that the axiom "use it or lose it" is rather banal – at least for the brain researcher and the psychologist. True as it may be that the brain changes depending on *how* it is used but we should be careful not to generalize. The first question we should ask when we

hear such assertions is, what "use" actually means. Are all kinds of activities equivalent? There are plenty of examples showing, how the brain can adapt to suit its environment and can be shaped by training.

3. Body and Memory in Digital Space

The "passage from biological to cultural", as suggested by the cybersociality, obliges us to "recodify", in the body, the orientation system in computer society. Information technology (ICT) is transforming the way people interact between themselves and with objects around them. The emergence of the contemporary complex, compound technologies that involve *virtuality*, *simulation* and *computer modelling (including tomography)* has special implications for embodiment and perception. Technologies, inventions of the human mind, obviously have a great impact on the functioning of the brain, on the working of mind and on memory. Kelly has coined a new term in his book, *What Technology Wants* (2010), that he calls the *technium.* Using this term he suggests that technology and life must share some fundamental essence, yet we have historically failed to understand and define, how technology is intertwined with biological life. Is technology a creation of human ingenuity or can it develop "wants" of its own? If one thinks about it, electronic networks exhibit near-biological behaviour in many respects. If you are still not convinced, then consider the PR2 research robot that has been programmed to look for power outlets and plug itself in, when it gets "hungry". Of course, we humans want certain things from the *technium* but at the same time there is an inherent bias in the *technium* that is outside our wants. Beyond our desires there is a tendency within the *technium* that – all other things being equal – favours a certain solutions.

The issues are complex and often confused, in part because there is overlap and loose usage concerning all the VSC technologies. In popular form, one can enter virtual raality in a virtual reality arcade. Unfortunately, the description and claims made for this arcade experience are usually cast in the now antiquated frame of early modern epistemology. According to Turkle (2005: 287), computers become "thinking tools" offering new models of what it means to know and to understand: computers, with their reactivity and interactivity, stand in a novel and evocative relationship between the living and the inanimate. They make it increasingly tempting to project our fee-lings onto objects and to treat things as though they were people—an impulse called by Turkle the "Eliza effect" after the early AI program that was designed to seem like a solicitous psychotherapist. Our connection with things, consequently, is becoming an "object relations"

perspective “that takes *objects*” as its *subject*. Relational artefacts ask their users to see them not as tools but as “companions”, as “subjects” in their own right. The simple robots are marketed as toys and the more advanced robots remain largely confined to research settings or are used for complicated tasks, such as flight simulation or flying unmanned aircraft. In the presence of relational artefacts, people feel attachment and loss.

Technology's focus is gradually shifting away from the computer as such, to the user. Electronic communication – personal computers linked together by the Internet – creates a world-wide web of memory banks. It produced a new form of space: the cyberspace that is a ‘no-space space’ because it cannot be localized, and localization is unimportant or immaterial. Timelines (i.e. temporal models) are replaced by spatial models (hyperlinks amongst web sites). This change of paradigm aims at making communication and computer systems simple, collaborative and transparent to the user. A first sign of this change has been the creation of totally new interactive communication environments, such as Computer Mediated Communication (CMC) and Computer Supported Collaborative Work (CSCW). The final steps towards this vision will be made possible by three dominant trends: - The increase of *richness and completeness of human-computer interaction*, through technology extensions of the senses and of the human body;

- The relevant *role of mobility*, through the development of mobile communications and extended networks;
- The *pervasive diffusion of intelligence* in the space around us, through the development of advanced biosensors.

The merging of these trends allows the emergence of a new vision : *Ambient Intelligence* (AmI), *a pervasive and unobtrusive intelligence in the surrounding environment supporting the activities and interactions of the users.* Ambient Intelligence (AmI) is a new paradigm in information technology, in which people are empowered through a digital environment that is aware of their presence and context, and is sensitive, adaptive, and responsive to their needs, habits, gestures and emotions. The most ambitious expression of AmI is Intelligent Mixed Reality (IMR), an evolution of traditional virtual reality environments. Using IMR, it is possiible to integrate computer interfaces into the real environment, so that the user can interact with other individuals and with the environment itself in the most natural and intuitive way.
www.neurovr.org/emerging/volume.html

As psychologists studying the effects of cyberspace on people point out, the sensory impacts that one experiences in everyday life, in interactions with others in society, are seriously altered in cyberspace.

Some of our sensory experiences – smelling and touching – disappear; others – seeing and hearing – remain but in a somewhat changed form. John Suler (2002), in his essay *Presence in Cyberspace*, analyses the effects of cyberspace on the individual engaged in VR. He concludes that in spite of some shortfalls of sensory experience in smell and touch, cyberspace 'is becoming increasingly more sophisticated in the visual and auditory stimulation provided.' He also acknowledges that in 'the life span, especially during childhood, humans rely heavily on the close stimulation of touch and smell in developing awareness of, and intimacy with, significant others.' In this he follows the discoveries of neurosociology. The difference between the two approaches is that neurosociology emphasises the importance of the physical, dyadic experience that cannot be replaced by VR, in spite of the ever increasing sophistication of cyberspace. Adherents to the 'presence' approach in cyberspace draw a parallel between interactivity in society and in cyberspace. Suler, for instance, stresses that online environments – even though they are still limited compared with physical ones – allow us 'to express a wide range of thoughts, memories, emotions and motives' as well as make it possible to exhibit personal identity, in particular when the expressions of identity become interactive. The author acknowledges that some individuals prefer online expression of their identity, their self, and depending on the personality type, experience differently the presence of others whom they encounter in cyberspace. Professor Suler admits that despite the 'powerful possibilities for the presence online, we must remind ourselves that indeed our body sits in a room, in front of a computer, in a setting that is quite different from the online encounter' and we cannot immerse ourselves fully into cyberspace and in-person presence simultaneously.' He concludes this study by saying that the worlds and relationships of cyberspace remind us that the being, here and now of presence resides in the human mind.' One could say without exaggeration that the invention and proliferation of VR have created the most profound intertwining of body (mind) and technology. It, however, transforms a person into an image, lifts him or her out of his or her social environment and allows one to present oneself in a subjective way, according to the individual's 'wish. Further studies are needed to ascertain whether a deep immersion in cyberspace (i.e. in virtual reality) does induce changes in neural processes of the human brain. One could argue whether technologies could substitute for emotions or will. Some theorists (Levy: 2007) give a positive answer to this problem, but even those who deny this possibility acknowledge that microelectronic technologies could influence emotions and will, and often do. Therefore, the question arises: Does human memory change as

'mapped' by these mobile, shifting boundaries? The human brain—unique in the organic world—has the infinite capacity to adapt itself to the changing conditions of life. Over the last few years popular books about the brain have become a literary genre. As advances in information technology and communication supply us with information at an ever accelerating rate, the limitations of our brains become all the more obvious. The modern work situation, with its pace and simultaneous demands, often gives us the feeling of having attention difficulties. The torrent of information increases not only the volume of data we are expected to take in, but also the volume we need to shut out. New findings in psychology and brain research suggest that the difficulties we find with simultaneous performance and distractions converge onto one central limitation: *the ability to retain information.*

Namely, it is questionable whether the ever greater and intrusive role of machines (computers) in human cognition—the constantly more complex character of artificial intelligence'—contributes to the plasticity of the brain or to the nuanced cognition. This is an open question; it would be premature to take a definitive position, but one cannot exclude either a positive or a negative answer to it. Suffice it to say that at present brain scientists, psychiatrists and psychologists disagree about the problem. Nonetheless, the fundamental difference between the brain and even the most sophisticated machines producing artificial intelligence is that the brain's fashion of recognizing images, sound, etc. is 'assembling' by a very large number of parallel processors the visual, auditory, etc. patterns. By contrast computers separate the Central Processing Unit (CPU) – the control unit – and the memory unit. As Lynch and Granger (2008: 17–32) emphasize, the computer's processing time is much longer than the human brain's. Geoffrey Hilton, a distinguished researcher of the University of Toronto and a pioneer in artificial intelligence stated, in an interview in the daily *Globe and Mail*, Toronto, February 12, 2011. that 'it is very hard to get computers that have the same amount of processing power and particularly the same access to stored knowledge. The brain can access many gigabytes of knowledge in a tiny fraction of a second. Only the biggest supercomputers can do that kind of thing at present.' One can add to it that all computers that have been built the same way function identically. The differences are in the programming. Humans are different, unique in their intelligence, talents, interests and because of their sociability, react to their social surrounding. Even identical twins, if they find themselves in different social conditions, develop their individual personality traits.

Fortunately, the information–processing approach became increasingly influential. Two books were particularly important. Donald Broadbent's *Perception and Com-munication* (1958) developed and applied Craik's seminal ideas to a range of work carried out at the Medical Research Council Applied Psychology Unit in Cambridge, England. Some 9 years later, this growing field was then brilliantly synthesized and summarized by Ulric Neisser (1967) in a book whose title provided a name for this burgeoning field: *Cognitive Psychology*. Using the digital computer as an analogy, human memory could be regarded as comprising one or more storage systems. Any memory system– whether physical, electronic, or human– requires three things: the capacity to *encode*, or enter information into the system, the capacity to store it, and–subsequently–the capacity to find and *retrieve* it.

Neural science and cognitive psychology have now found a common ground, and we are beginning to benefit from the increased explanatory power thatresults from the convergence of two initially disparate disciplines. Recently, in large measure due to the work of the neuroscientists Patricia Goldman–Rakic (1987: 373–417) and Joaquin Fuster (1997), the concept of working memory has gained prominence. Much has been written on the subject of working memory over the last few years. A book by the Swedish cognitive neuroscientist Torkel Klingberg (2008), *The Overflowing Brain*: *Information Overload and the Limits of Working Memory*, stands out as a particularly lucid rendition of the subject. Working memory is closely linked to the critical role that the frontal lobes play in the temporal organization of behavior and in controlling the proper sequence in which various mental operations are enacted to meet the organism's objective. Today the concept of working memory is among the trendiest in cognitive neuroscience. As is the case with trendy concepts, it is often used arbitrarily and loosely, as times being rendered meaningless. This is why it is particularly important to discuss this concept carefully and rigorously. It is often said that "working memory is like short–term memory". Well, if it is so much like short–term memory, then why do we need a new term? Creating duplicate terminology without new meaning obfuscates things rather than clarifying them.

According to Goldberg (2009: 94), we define working memory as *the selection of task–relevant information*. The neural circuitry of working memory is the focus of intense research with both experimental and computational methods (Amit, Fusi and Yacovlev (1997:1071–92); Mongillo Machens, Romo, Brody, 2005: 1121:4); Mongillo, Barak, Tsodyks (2008: 1543–46). One of the defining characteristics of working

memory is its very *limitation*. If you are told "Go straight ahead for two blocks and then left one block", you will have no difficulty remembering where to go. The capacity limitation of working memory is one of the things that distinguish it from long-term memory. What makes working memory particularly interesting is that it not only retains instructions, numbers, and positions in the memory, but also seems to play a critical part in our ability to solve problems. It does not operate in a *vacuum*: it involves goals, plans, and beliefs and is about the stakes (active goals) and options a person has for managing person–environment relationships. Modern interest in unconscious processes, the concept that is sensory or perceptual is also perforce, motor, and what is called action theory, which emphasizes goals, intentions, and plans– all reflect a much freer search for understanding how the mind works than was possible in past decades. Although this freedom troubles many, we believe it has been a major stimulant for a renewed interest in the body. By inserting itself into every situation, the body carries its own past into the surroundings as a procedural field. Its experiences and dispositions permeate the environment like an invisible net that projects from its senses and limbs, connects us with the world and renders it familiar to us. Each perception, each situation is permeated by implicit bodily recollections. The memory of the body is an impressive refutation of the dualism of consciousness and the physical body. As an example one can mention that when o-ne is dancing, the rhythmic movements are released by the body, spontaneously, wi-thout the need to make them deliberately, and yet the dancer is guiding his/her movements according to the gesture and rhythm felt. The person is still dancing by him/herself, and is not a ghost in a body machine. Almost sixty years ago Sir Frederic Bartlett (1932) investigated the claim that the Swazi of South Africa had remarkable memory abilities. Bartlett's findings are an example of one of the most important generalizations about memory, namely, information on any given topic will be much better remembered by individuals who have a great interest in it than by those who do not. For example, cattle are of great importance to the Swazi of South Africa, and so they remember cattle transactions in great detail. This is a typical exchange skill for the capacity of working memory. Effective motivation involves, indeed, implementation of intentions to minimize the chances of being distracted while working towards a goal.

It is up to us to control our environments and reshape the work we do to our abilities. The world around us is constantly changing and we have to react to the change through a plastic response allowing us to deal with new and unexpected experiences foreign to our individual past. In considering memory as a procedural faculty, we suggest therefore that rather than