Psychologica Belgica
1996, 36-4, 197-208.

INVITED ADDRESS

A SCIENTIFIC AUTOBIOGRAPHY

Paul BERTELSON
Université libre de Bruxelles

The text was prepared at the request of the National Fund for Scientific Research on the occasion of the 1995 Quinquennial Prizes award ceremony. After a reference to the author's formation years in Brussels and Cambridge, the main leading themes of the work carried out in the last 40 years at the Brussels Experimental Psychology Laboratory and some other places are briefly described.

I have been doing research in psychology for now more than forty years. That was however not the result of anything like a call. I landed in psychology after a somewhat tortuous academic itinerary. Leaving highschool at the Liberation, and after a few months in Ulster as a volunteer in a unit of the newly reconstituted Belgian army, having to choose a university curriculum, I hesitate between about everything, from mathematics to philosophy, through history and biology. During the curriculum in applied economics I eventually applied at "Université libre de Bruxelles" (U.L.B.). I feel mostly attracted by scientific topics, in the case economic theory. Through intensive reading I acquire the elementary competence which allows me to obtain a C.R.B. fellowship for a stay in the US and an admission to the Harvard graduate school of Economics. At the last moment, health problems prevent my going and impose a revision of my plans. Now, however, I know for sure that I want to work in research. It is the time when I meet the man who will be my mentor, the neuropsychologist André Ombredane whom the Brussels University has called from Paris to launch the newly created curriculum of studies in psychological science.

Ombredane is known mainly as a student of aphasia, but his scientific appetite is voracious. At U.L.B., where he will spend ten years before his untimely death in 1958, he develops an exuberant activity, which extends from experimental psychology to ethology, from intercultural studies and

---

Professor Dr. Paul Bertelson was the beneficiary of the Ernest-John Solvay Quinquennial Award for the Human Sciences in 1995 for his significant contributions to the scientific development of cognitive psychology in Belgium. To commemorate this event, Paul Bertelson was invited to contribute an article to *Psychologica Belgica*. The present article is based on a text prepared at the request of the Belgian National Fund for Scientific Research (FNRS).

The author gratefully acknowledges the succesful efforts of Michel Imbert, Pim Levelt, Jacques Mehler, Mike Posner, Xavier Seron and Géry d'Ydewalle at convincing the award committee in his favour.

Correspondence concerning this article should be addressed to Paul Bertelson, Laboratoire de Psychologie expérimentale, Université libre de Bruxelles, 50 Av. F. D. Roosevelt, 1050 Bruxelles. Electronic mail may be sent to: pbrtlsn@ulb.ac.be.

psycholinguistics to clinical work (3, 15). Through his communicative enthusiasm and his gift for launching ideas, he attracts all those who want to know what is new in psychology. A friend introduces me, Ombredane accepts me in his laboratory and makes me discover experimental psychology. Mentor in the real world as well as in the intellectual one, he gets me the positions which allow me to try myself at experimentation. He also helps me organize a stay in Cambridge, England, in a laboratory where, to judge from the literature, really innovative research on human skill is being carried out. It is the Medical Research Council Applied Psychology Research Unit (A.P.R.U., later A.P.U.).

For psychological science, the late 50s were a turning point. Under the influence of conceptions from, among other disciplines, cybernetics, information theory, psychophysiology (Hebb's ideas on neuronal networks) or also from generative linguistics, new ways of doing psychology were appearing. They injected new life into projects for the analysis of mental activity which had figured prominently in the experimental psychology of the late XIXth century, but had later been banned under the influence of the methodological puritanism which reigned in many laboratories in the period between the wars. The new movement took shape in some centers of the American east coast, like M.I.T. and Harvard, and, in Europe, precisely at the Cambridge A.P.R.U. It was the starting point for what Ulrich Neisser would ten years later call *Cognitive Psychology* (57).

In Cambridge, I find myself in the inspiring environment I had been expecting. The creation of the unit is the result of the efforts of the great Frederic Bartlett. He often comes at tea time, and he likes to talk about his friend Michotte with the young Belgian visitor. But also, he makes about current scientific developments comments the pertinence of which I shall only be able to appreciate several years later. Among researchers, there are personalities like Norman Mackworth, Donald Broadbent, Rubin Conrad, Chris Poulton or Alfred Leonard. Broadbent is running his famous experiments on auditory attention and he is developing the general theory of human performance which will be published the following year in his book "Perception and Communication" (37). This theory, in which performance was seen as resulting from processes occurring in real time, and implying a series of internal representations and of operations on these representations, was one of the first examples of a specifically functional form of explanation of behaviour. It is now generally considered as one of the foundational events of cognitive psychology.

The experimental work I start in Cambridge, and which will provide in 1959 the substance of my doctoral thesis, concerns the serial chaining of elementary decisions. It is based on the measurement of reaction time, i.e. the duration elapsing between a perceptible event and the production of the relevant response. Each response, in the task I am using, pressing one of several keys, triggers the presentation of the next signal. The results reveal a time gain for

those reactions on which the signal is the same as on the previous reaction, a phenomenon I propose to call *the repetition effect* (4, 5, 6). At the time, the phenomenon raised interest mainly because it was not predicted by the current application of information theory to mental chronometry. Following that application, the reaction time to a signal depended exclusively on its instantaneous probability of occurrence, which is the same whether the signal is repeated or not. From a contemporary perspective, the importance of the effect lies rather in the fact that it first showed how repetition of a task feature can inform us about underlying cognitive operations. A few years later, the repetition effect would be the starting point for the *priming paradigm*, in which a *target signal*, calling for a particular reaction, is preceded by a *prime stimulus* which does or does not share some attribute with the target. When it does, for instance if it is a semantic associate of the target, the response is facilitated. Priming is now one of the most frequently used procedures for the analysis of cognitive processes, for instance in work on the recognition of written or spoken words (56).

Shortly after returning to Brussels, I had to take over an important part of Ombredane's courses. Like most university teachers, I thus became a part-time researcher. A few years later, the "Laboratoire de Psychologie expérimentale" was officially established at U.L.B. and the essential part of my activity was hence focused on the development of the working facilities of that unit. The beginnings were difficult, for the idea that real empirical research could be carried out in a "human science" was not readily accepted. A major step was in 1967 the obtention of a grant from the National Fund for Fundamental Collective Research which provided much needed assistance for collecting experimental data. Later came doctoral studentships from the National Fund for Scientific Research, and in recent years the more extensive provisions of national and international research programs. It has been my chance that when grants or jobs became available, I nearly every time could find good candidates to take advantage of them.

In the general line of the work on the serial chaining of processing operations, I took opportunity of a new stay in Cambridge to start a new set of experiments concerning the phenomenon called *psychological refractory period*. When the signal for a reaction arrives during the reaction time to an earlier signal, a delay is generally observed in the reaction to the second signal, which to many of us suggested the existence of a sort of waiting cue for the occupation of a central limited capacity device. I could show that the predictions from the limited capacity hypothesis are verified, provided the subject has to process each signal as soon as it occurs (7, 8, 33). A series of studies we carried out in parallel concerned the *preparatory processes* triggered by signals bringing information about either the nature or the time of occurrence of the target stimulus of a reaction (20, 19, 9, 32).

Still about general problems of mental chronometry we have examined the information that can be provided by a task different from reaction, judgement of the order of occurrence of two signals. In his doctoral thesis, Claude Vanderhaegen showed that the probability of occurrence of particular signals, which exerted a strong effect on identification speed, had no influence whatever on time order judgement (65). This result was an early demonstration of the possibility of dissociations between conscious representations and non-conscious underlying processes, a kind of phenomenon that has received a good deal of attention in recent years (63).

In parallel with the work on mental chronometry, I had kept an active interest for more traditional problems of perception, which occupied a central place in the courses I was teaching. I had early on been fascinated by data on adaptation to intermodal conflicts, like the conflict between vision and proprioception which occurs when a body part is seen through an optical device like a prism. With Monique Radeau, who later was going to devote her doctoral dissertation to the problem, I launched a series of studies on the interactions between auditory and visual data in the localization of events (30, 31, 59, 60, 61, 62, 16). We could thus put in evidence principles which govern the formation of crossmodal patterns and are often very similar to those at the basis of intramodal patterning. I have maintained an active interest in these problems all through my career, and in recent years, I have started with my colleagues Béatrice de Gelder and Jean Vroomen from Tilburg University a study of the relation between spatial auditory-visual interactions and those that were described in speech recognition, where visual data from the talker's face can play an important role in identification performance (36). Another project currently carried out with Gisa Aschersleben at the Max-Planck Institute for Psychological Research in Muenchen is focused on isolating the automatic components of crossmodal interaction from more controlled ones (18).

The kind of explanation that cognitive psychology proposes is in terms of processing units defined by their function, not of neurophysiological mechanisms nor of neuroanatomical localization. That choice has allowed the cognitive approach to make considerable progress in autonomous fashion. But it does not imply that biological data should be ignored: cognitive and neurobiological data concern the same object, they must eventually converge, and they already did in some cases.

During the 60s, the idea took shape that performance measures could provide information on the respective functions of the cerebral hemispheres. The notion was to take advantage of the architecture of sensory connections, which in the majority of modalities is such that stimulation reaching the right half of the receptive periphery of right-handed people are first transmitted to the left hemisphere, and vice versa. It was found for instance that when a speech fragment is presented to the right ear and a different fragment is presented

simultaneously to the other ear, the right ear fragment is better recognized (45). The prevalent interpretation of that *right-ear advantage* has been that it results from the fact that right-ear data are projected mainly in the left hemisphere, which is specialised for language processing. José Morais and I have shown that things are actually more complicated. When the two fragments are presented in open space over two loudspeakers, so that each input reaches the two ears, but with intensity and phase differences which produce a stereophonic separation effect, a superior recognition of the right stimulus is still observed (27, 43, 44, 50, 51). Thus, the perceptual asymmetry arises after the processing stage at which the data from the two ears are integrated into an impression of spatial localisation.

For what regards hemispheric specialisation, this sort of result guarded against too direct inferences from behavioral asymmetries to cerebral structure. One very critical example was provided by the lateral asymmetry which appeared in the *click-on-sentence task*, in which subjects have to estimate where in a spoken sentence a non-speech noise, a click, has been superimposed. In 1965, Fodor & Bever (41) found that the click was located earlier when it was presented to the left ear and the sentence to the right ear, than with the opposite arrangement, and the effect was thought to be due to left hemisphere specialisation for speech. We showed that it actually depended on the direction of writing of the language of the sentence: Hebrew-French bilingual subjects had the effect in the same direction as English or French speaking ones with a French sentence and in exactly the opposite direction with a Hebrew sentence (10,34).

Another example was provided by visual field effects observed in face recognition. We could demonstrate that the identification of a face in a task of sequential comparison of two photographs is achieved faster on the basis of a left visual field presentation - as predicted from the hypothesis of right hemisphere specialisation for processing faces - only when the photographs to be compared differed by the orientation of the faces or by their expression, so that the pairs leading to the response "same" were not physically identical and the processing had to reach the level of face-specific invariants (35; see 53 for convergent results by Moscovich et al.).

In a critical review of the work on lateral differences (12, see also 11), it was suggested that the ambitions of the program could only be achieved through finer cognitive analyses of the tasks than was the case in many studies then available. It seems that the conclusion still applies to the research carried out these days with the impressive new brain imagery techniques. When one considers the results published in recent years, it is clear that the most significant steps have come from experiments based on tasks which were well designed from the cognitive point of view and allowed non-ambiguous interpretations.

About the time this assessment of laterality work was published, a new and,

in my view, more promising approach, that of *cognitive neuropsychology* was emerging. It was basically applying to the understanding of performance deficits consequent on brain lesions the models of normal functioning proposed by cognitive psychology (64). A fruitful collaboration ensued between clinical work, which gained the theoretical substratum that classical neuropsychology missed, and cognitive psychology which got access to a particularly powerful data base. Although I had until recently few opportunities to work personally with patients, I followed as closely as I could the progress of the new discipline, in particular through our contacts with the team of Xavier Seron at Louvain-la-Neuve and my implication in the Bressanone "European Workshops on Cognitive Neuropsychology".

The example of cognitive neuropsychology shows that the cognitive approach has important applications outside the laboratory in the analysis of everyday activities. One activity which was the focus of specially fruitful applications is *reading*. Models of several processes involved in reading, like word recognition, have been developed and tested on data from both the laboratory and the clinic.

Toward the end of the 70s, the different competences represented in our group were putting us in a favorable situation to participate in the movement. About that time, we started work on reading along four different lines concerning respectively written word recognition in the adult reader (42), reading acquisition, the tactile reading of the blind and reading in the deaf (2). These four themes provided the substance of a research project which was selected a few years later by the Scientific Policy Services of the Belgian State for support as a "Concerted Research Action". It was the first time support from that source, the most prestigious in the country, was granted for a project belonging to the human sciences. I was personally involved mainly in the work on acquisition and in that on tactile reading.

The work on reading acquisition started from the notion, originally put forward by the Haskins Laboratory group (46, 47) and now very generally accepted, that to learn to read an alphabetic orthography the child must be able to conceive explicitly of speech as a sequence of phonemes - those units which the alphabet in first approximation represents - and that the difficulties encountered by many children have their origin at that level. Our main contribution, which resulted from a close collaboration between José Morais, Jésus Alegria and myself, concerned the conditions under which the ability develops, and in particular the degree of spontaneity of the development. Resorting to a comparative approach, we administered speech segmentation tasks - like repeating a word without its initial consonant - to populations varying at the level of educational history or of other factors: children of different ages, more or less proficient readers, brain damaged patients, illiterate or recently alphabetized adults (13, 14, 22, 23, 26, 38, 49, 52). More recently,

in collaboration with Béatrice de Gelder and her group at Tilburg University, and with colleagues in Hong Kong, Taiwan and Beijing, we have extended the approach to readers of non-alphabetic writing systems like Japanese or Chinese (21, 24, 40,). Taken together, the results show that segmentation of speech into phonemic segments does not emerge spontaneously under the influence of maturation or of the experience of speech communication, but requires specific educational experiences, like those provided by alphabetic reading instruction. On the other hand some degree of spontaneity manifests itself for units at other levels like the syllable or the rime. Those results have important implications for reading instruction (1, 13, 25, 39, 48), but which in many countries, among which ours, come in conflict with well-established traditions.

The work on tactile reading has started with a study of the manual exploration strategies used by braille readers. With Philippe Mousty, we recorded the movements of the hands during reading of different kinds of text, and we obtained a description of exploration patterns much more detailed than any available at the time (28, 54). For two-handed reading, the mode resorted to by the majority of experienced readers, the most frequent pattern is one in which the two hands scan different segments of each line. That pattern apparently allows faster reading. These results have implications both for the teaching of braille reading and for the design of braille terminals which make computers accessible to blind people. Later studies were focused on particular components of the reading process like word recognition (29) or syntactic parsing (55). Each time, the main question was to know if factors which are known to affect visual reading exert a comparable influence on braille reading. The case of braille makes it possible to assess the generality of theories which were developed on the basis of data from visual reading (17).

The last kind of question, which we first considered for the case of braille, was later extended to the general problem of the role of input modality in language processing. A new project dealing with the comparison of written language, braille and speech, in both its acoustic and visual aspects, was selected for support by the Belgian French-speaking Community as a new Concerted Research Action. About the same time, we were invited together with groups from France, Great Britain, Japan, the Netherlands, Spain and Canada, to participate in a project on the influence of particular phonological features of the language on speech perception, which obtained the support of the international "Human Frontier of Science" program.

For somebody working in a small country, the international dimension of scientific life has always been essential. In the 50s, there were few specialised meetings, and big conferences such as the International Congress of Psychology provided about the only encounter opportunities for psychologists from different countries. In my case, a memorable occasion was the first *Attention and Performance* symposium which was held in the Netherlands in the summer of

1966. It was one of the first meetings at which cognitive psychologists from the two sides of the Atlantic came together. There is for a beginning scientist something extraordinary in seeing what were until then just names in his bibliography become real people. I was for several years a regular participant at Attention and Performance, which fast became the main invited meeting in the field, the one at which important findings were often reported first. I have learned much of value also at the meetings of the British *Experimental Psychology Society* and, starting in the 70s, at those of the *Psychonomic Society*, the main psychological science meeting in the United States. In neuropsychology, I was a member of the group surrounding the journal *Neuropsychologia*, and at their annual meetings, I enjoyed for several years their way of making informality into an art. Later, I participated in the unofficial organising group of the European Workshops in Cognitive Neuropsychology held annually in Bressanone since 1983. In 1984, the idea took shape of setting up a European organization in cognitive psychology, and I was a member of the group of five colleagues who founded and managed through its starting years the *European Society for Cognitive Psychology*. That society corresponded to a real need, for its meetings became rapidly the occasion at which specialists from all countries of Europe and beyond came together.I must finally mention the *25th International Congress of Psychology* which was held in Brussels in 1992, and of which I was co-president with Géry d'Ydewalle. The organisation of such a big manifestation was for the very small group of colleagues who were in charge a redoubtable honour. But we finally succeeded in setting up a very good scientific program, a reflection of the vitality of contemporary psychological science.

International contacts were for me a constant source of intellectual stimulation. Also, they allowed me to develop the kind of friendships which in my view are one of the most precious rewards of scientific effort.

In 1990, I was as Emeritus Professor discharged of my teaching duties, while keeping the right to carry on scientific work at the University. I could thus devote myself to research more than in the preceding decades. I could for example take better opportunity of foreign collaborations: with the Tilburg group, which was quoted already, with Chinese colleagues in Hong Kong, Taiwan and Beijing, or with the München Max-Planck Institute for Psychological Research. Thus, I could start work on new research themes, like visual speech perception (lipreading), or go back with new perspectives to themes I had been dealing with earlier, such as spatial crossmodal interactions or explicit representation of phonology. Also, I could again be involved in experimental work in its most concrete details, probably the side of the research trade that I personally most value and which I long resented having to sacrifice to other responsibilities.

References

1) Adams, M. J. (1990). *Beginning to read: Learning and thinking about print.* Cambridge, MA: MIT Press.
2) Alegria, J. (1981). The development of referential communication in deaf and hearing children: Competence and style. *International Journal of Behavioral Development, 4*, 259-312.
3) Bertelson, P. (1959). Le Professeur Ombredane à l'Université de Bruxelles. *Bulletin du CERP, 8*, 1-4.
4) Bertelson, P. (1961). Sequential redundancy and speed in a serial two-choice responding task. *Quarterly Journal of Experimental Psychology, 13*, 90-102.
5) Bertelson, P. (1963). S-R relationships and reaction time to new versus repeated signals in a serial task. *Journal of Experimental Psychology, 65*, 478-484.
6) Bertelson, P. (1965). Serial reaction-time as a function of response vs signal-response repetition. *Nature, 204*, 217-218.
7) Bertelson, P. (1966). Central intermittency twenty years later (Invited paper). The *Quarterly Journal of Experimental Psychology, 18*, 153-163.
8) Bertelson, P. (1967). The refractory period of choice reactions with regular and irregular interstimuli intervals. In A.F. Sanders (Ed.), *Attention and performance* (pp. 45-56). Amsterdam: North Holland.
9) Bertelson, P. (1967). The time course of preparation. *The Quarterly Journal of Experimental Psychology, 19*, 272-279.
10) Bertelson, P. (1972). Listening from left to right versus right to left. *Perception, 1*, 161-165.
11) Bertelson, P. (1981). The nature of hemispheric specialization: Why should there be a single principle? *Behavioral and Brain Sciences, 4*, 63-64.
12) Bertelson, P. (1982). Lateral differences in normal man and lateralization of brain function. *International Journal of Psychology, 17*, 173-210.
13) Bertelson, P. (1986). The onset of literacy: Liminal remarks. *Cognition, 24*, 1-30.
14) Bertelson, P. (Ed.). (1987). *The onset of literacy: Cognitive processes in reading acquisition*. Cambridge: The MIT Press.
15) Bertelson, P. (1992, July 23). André Ombredane and the start of psychology studies at the Free University of Brussels. *Brussels Congress News, 5* (Daily paper of the 25th International Congress of Psychology).
16) Bertelson, P. (1994). The cognitive architecture behind auditory-visual interaction in scene analysis and speech identification. *Current Psychology of Cognition, 13*, 69-75.
17) Bertelson, P. (1995). Language by touch: The case of braille reading. In B. de Gelder & J. Morais (Eds.), *Speech and reading: A comparative approach* (pp. 91-108). Hillsdale, NJ: Erlbaum.
18) Bertelson, P., & Aschersleben, G. (1996). Visual bias of auditory location: Evidence for automaticity. *Abstracts of the Psychonomic Society, 1*, 74.
19) Bertelson, P., & Barzeele, J. (1965). Interaction of time uncertainty and signal relative frequency in determining choice reaction time. *Journal of Experimental Psychology, 70*, 448-451.
20) Bertelson, P., & Boons, J.-P. (1960). Time uncertainty and choice reaction time.

Nature, *187*, 531-532.

21) Bertelson, P., Chen, H. C., & de Gelder, B. (in press). Explicit speech analysis and orthographic experience in Chinese readers. In H. C. Chen (Ed.), *The cognitive processing of Chinese and other Asian languages*. Amsterdam: Benjamins.

22) Bertelson, P., & de Gelder, B. (1989). Learning about reading from illiterates. In A. Galaburda (Ed.), *From neurons to reading* (pp. 1-23). Cambridge, MA: The MIT Press.

23) Bertelson, P., de Gelder, B., Tfouni, L.V., & Morais, J. (1989). Metaphonological abilities of adult illiterates: New evidence of heterogeneity. *European Journal of Cognitive Psychology*, *1*, 239-250.

24) Bertelson, P., & de Gelder, B. (1991). The emergence of phonological awareness: comparative approaches. In I.G. Mattingly & M. Studdert-Kennedy (Eds.), *Modularity and the motor theory of speech perception* (pp. 392-412). Hillsdale, NJ: Erlbaum.

25) Bertelson, & de Gelder, B. (1994). The cognitive psychology of literacy: Some basic findings. In L. Verhoeven (Ed.), *Functional literacy: Theoretical issues and educational implications* (pp. 151-162). Amsterdam: Benjamins.

26) Bertelson, P., Morais, J., Alegria, J., & Content, A. (1985). Phonetic analysis capacity and learning to read. *Nature*, *313*, 73-74.

27) Bertelson, P., Morais, J., Mousty, P., & Hublet, C. (1987). Spatial constraints on attention to speech in the blind. *Brain and Language*, *32*, 68-75.

28) Bertelson, P., Mousty, P., & D'Alimonte, G. (1985). A study of braille reading. 2. Patterns of hand activity in one-handed and two-handed reading. *The Quarterly Journal of Experimental Psychology*, *37*, 235-256.

29) Bertelson, P., Mousty, P., & Radeau, M. (1992). The time course of Braille word recognition. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *18*, 284-297.

30) Bertelson, P., & Radeau, M. (1976). Ventriloquism, sensory interaction and response bias: Remarks on the paper by Choe, Welch, Gilford and Juola. *Perception and Psychophysics*, *19*, 531-535.

31) Bertelson, P., & Radeau, M. (1981). Cross-modal bias and perceptual fusion with auditory-visual spatial discordance. *Perception and Psychophysics*, *29*, 578-587.

32) Bertelson, P., & Tisseyre, F. (1966). Choice reaction time as a function of stimulus versus response relative frequency of occurrence. *Nature*, *212*, 1069-1070.

33) Bertelson, P., & Tisseyre, F. (1969). Refractory period of c-reactions. *Journal of Experimental Psychology*, *79*, 122-128.

34) Bertelson, P., & Tisseyre, F. (1972). Lateral asymmetry in the perceived sequence of speech and nonspeech stimuli. *Perception and Psychophysics*, *11*, 356-362.

35) Bertelson, P., Vanhaelen, H., & Morais, J. (1979). Left hemifield superiority and the extraction of physiognomic information. In I.S. Russel, M.W. Van Hof, & G. Berlucchi (Eds.), *The structure and function of the cerebral commissures* (pp. 400-410). London: McMillan.

36) Bertelson, P., Vroomen, J., Wiegeraad, G., & de Gelder, B. (1994). Exploring the relation between McGurk interference and ventriloquism. *International Congress on Spoken Language Processing* (Yokohama) (pp. 559-562).

37) Broadbent, D. E. (1958). *Perception and communication*. Oxford: Pergamon.

38) Content, A., Kolinsky, R., Morais, J., & Bertelson, P. (1986). Phonetic segmentation in prereaders: Effect of corrective information. *Journal of Experimental Child Psychology, 42*, 49-72.
39) Content, A., Morais, J., Alegria, J., & Bertelson, P. (1986). Acquisition de la lecture et analyse segmentale de la parole. *Psychologica Belgica, 26*, 1-15.
40) De Gelder, B., Vroomen, J., & Bertelson, P. (1993). The effect of alphabetic reading competence on language representation in bilingual Chinese subjects. *Psychological Research, 55*, 315-321.
41) Fodor J., & Bever, T.G. (1965) The psychological reality of linguistic segments. *Journal of Verbal Learning and Verbal Behaviour, 4*, 414-420.
42) Holender, D. (1985). Disruptive effect of precueing on the identification of letters in masked words: An attentional interpretation. In M. I. Posner & O. S. M. Marin (Eds.), *Attention and performance* (Vol. 11). Hillsdale, NJ: Erlbaum.
43) Hublet, C., Morais, J., & Bertelson, P. (1976). Spatial constraints on focused attention: Beyond the right-side advantage. *Perception, 5*, 3-8.
44) Hublet, C., Morais, J., & Bertelson, P. (1977). Spatial effects in speech perception in the absence of spatial competition. *Perception, 6*, 461-466.
45) Kimura, D. (1961). Cerebral dominance and the perception of verbal stimuli. *Canadian Journal of Psychology, 15*, 166-171.
46) Liberman, I.Y., Shankweiler, D., Liberman, A.M., Fowler, C., & Fischer, F. W. (1977). Phonetic segmentation and recoding in the beginning reader. In A.S. Reber & D.L. Scarborough (Eds.), *Toward a psychology of reading*. Hillsdale: Erlbaum.
47) Mattingly, I. G. (1972). Reading, the linguistic process, and linguistic awareness. In J. F. Kavanagh & I. G. Mattingly (Eds.) *Language by ear and by eye*. Cambridge, MA: MIT Press.
48) Morais, J. (1994). *L'art de lire*. Paris: Odile Jacob.
49) Morais, J., Bertelson, P., Cary, L., & Alegria, J. (1986). Literacy training and speech segmentation. *Cognition, 24*, 45-64.
50) Morais, J., & Bertelson, P.(1973). Laterality effects in diotic listening. *Perception, 2*, 107-111.
51) Morais, J., & Bertelson, P. (1975). Spatial position versus ear of entry as determinant of the auditory laterality effects: A stereophonic test. *Journal of Experimental Psychology: Human Perception and Performance, 104*, 253-262.
52) Morais, J., Cary, L., Alegria, J., & Bertelson, P. (1979). Does awareness of speech as a sequence of phones arise spontaneously? *Cognition, 1*, 323-331.
53) Moscovitch, M., Scullion, D., & Christie, D. (1976). Early vs late stages of processing and their relation to functional hemispheric asymmetries in face recognition. *Journal of Experimental Psychology: Human Perception and Performance, 2*, 401-416.
54) Mousty, P., & Bertelson, P. (1985). A study of braille reading: 1. Reading speed as a function of hand usage and context. *The Quarterly Journal of Experimental Psychology, 37*, 217-233.
55) Mousty, P., & Bertelson, P. (1992). Finger movements in braille reading: The effect of local ambiguity. *Cognition, 43*, 67-84.
56) Neely, J. H. (1991). Semantic priming effects in visual word recognition: A selective review of current findings and theories. In D. Besner & G. W. Humphreys

(Eds.), *Basic processes in reading: Visual word recognition*. Hillsdale, NJ: Erlbaum.
57) Neisser, U. (1967). *Cognitive psychology*. New York: Appleton-Century-Crofts.
58) Radeau, M., & Bertelson, P. (1969). Adaptation à un déplacement prismatique sur la base de stimulations exafférentes en conflit. *Psychologica Belgica, 9*, 133-140.
59) Radeau, M., & Bertelson, P. (1974). The after-effects of ventriloquism. *The Quarterly Journal of Experimental Psychology, 26*, 63-71.
60) Radeau, M., & Bertelson, P. (1976). The effect of a textured visual field on modality dominance in a ventriloquism situation. *Perception and Psychophysics, 20*, 227-235.
61) Radeau, M., & Bertelson, P. (1977). Adaptation to auditory-visual discordance and ventriloquism in semirealistic situations. *Perception and Psychophysics, 22*, 137-146.
62) Radeau, M., & Bertelson, P. (1987). Auditory-visual interaction and the timing of inputs: Thomas (1941) revisited. *Psychological Research, 49*, 17-22.
63) Schacter, D. L., McAndrews, M. P., & Moscovitch, M. (1988). Access to consciousness: Dissociations between implicit and explicit knowledge in neuropsychological syndrome. In L. Weiskrantz (Ed.), *Thought without language*. Oxford: Clarendon Press.
64) Shallice, T. (1988). *From neuropsychology to mental structure*. London: Cambridge University Press.
65) Vanderhaeghen, C., & Bertelson, P. (1974). The limits of prior entry: Nonsensitivity of temporal order judgments to selective preparation affecting choice reaction time. *Bulletin of the Psychonomic Society, 4*, 569-572.

Received November, 1996
Accepted December, 1996