Journal of the International Neuropsychological Society (2000), **6**, 366–374.

BOOK REVIEWS

A Preconceptioned Perspective on a Plethora of Papyrologic Philosophers

The Nature of Consciousness: Philosophical Debates, N. Block, O. Flanagan, and G. Güzeldere (Eds.). 1997. Cambridge, MA: MIT Press. 843 pp., $29.95 (PB).

Consciousness Lost and Found, by L. Weiskrantz. 1997. New York: Oxford University Press. 294 pp., $25.00 (HB).

Reviewed by J.E. Bogen, *Clinical Professor of Neurological Surgery, U.S.C., Adjunct Professor of Psychology, UCLA, and Visiting Professor of Biology, Caltech, Pasadena, CA.*

Biased over 70 years of acquired preconceptions, I will discuss mainly *Philosophical Debates*, with occasional references to *Consciousness Lost and Found*. The bottom line is that neuropsychologists are more likely to benefit from *Lost and Found* than from *Debates*.

Debates is a profusely footnoted tome[1] which provides an overview of what three dozen contemporary philosophers, writing in English, have to say about consciousness. Readers will be exposed to much meticulous (even lawyerly) argumentation and you may enjoy the self-confident manner in which these philosophers make their moves and countermoves. Consider Lycan, "I am not here addressing issues of qualia or phenomenal character, which I have resolved almost entirely satisfactorily elsewhere" (p. 756).

Some readers may want to know what Lycan has so happily resolved. A quale (singular) is a "raw feel" or "immediate sensation" or "phenomenal experience" and for many modern philosophers it is the indispensable essence of consciousness.[2] In the index to *Debates* there are more references (48) to qualia than to anything else including Cartesian materialism (21), epiphenomenalism (22), functionalism (40), mental states (22), and brain (5). You can get a feel for what the word "qualia" means from the contexts in which it appears. However, you may not bother if you believe Dan Dennett, who in chapter 40 argues that there are no such things as qualia. Even if there are, Lycan says, "I think qualia problems and the nature of conscious awareness are mutually independent and indeed have little to do with each other" (p. 756). Nevertheless, chapters 40 to 44 are *entirely* devoted to the nature of qualia.

Debates has fifty chapters, most of them reprinted from earlier publications. There are 10 sections, beginning with "I. Stream of Consciousness." This starts with a nice selection from William James (1910) including his picture of awareness, not as a sharply edged spotlight but as a more or less bell-shaped curve for each conscious thought, followed not by an abrupt transition to the next thought but rather by an overlap of the three curves: now, just past, and just emerging, "The waxing and waning brain processes at every moment blend." The now-thought is surrounded by a halo of relationships called by James "the fringe," discussed in detail recently by Galin (1997). Then follows "II. Methodology," which contains Patricia Churchland's rhetorical question entitling chapter 7, "Can neurobiology teach us anything about consciousness?" She gives reasons why the answer is yes, but not much, seems to be the answer from most of the other philosophers. Section III gives us three psychologists (Baars, Farah, Shallice), one neurologist (Bisiach) and two biologists (Crick and Koch). The 1990 essay by Crick and Koch (chapter 10), once indispensable reading for those interested in the physiology of consciousness, has been succeeded by an article (Crick & Koch, 1998) in which they summarize their 1990 essay and review more recent developments. They reiterate their expectation that there will be one, or at most a few consciousness mechanisms; Farah and Bisiach strongly differ.

Both Farah and Bisiach cover material (neglect, etc.) already known to neuropsychologists and conclude that con-

[1] McGinn's chapter 33 has a text of 11 pages and 3 pages of footnotes. And Güzeldere's very helpful introduction has 45 pages of text and 22 pages of footnotes.

[2] According to the *Oxford English Dictionary* a "quale" (rhymes, almost, with folly or good golly) means "the quality of a thing." The OED also has quale (pronounced like quail) which means torment or torture (see also Ramachandran and Hirstein, 1997).

sciousness is, in Bisiach's words, "far from being unitary" and "rests entirely on a virtual mechanism distributed over brain circuits." Farah asserts, "There is currently no evidence for a dedicated awareness system distinct from the systems that perform specific perceptual or cognitive functions." By contrast, it seems to others, (Baars, 1993, Shallice, in *Debates*, chapter 13; Schacter, 1989; Bogen, 1997a) that there *is* evidence for a dedicated awareness system. Time will tell. Meanwhile, since no brain mechanism, focal or global, for consciousness is yet widely accepted, there seems to remain considerable room for the sort of metaphysical debates which, before the double helix, dealt with the nature of life.

After section III, for the remaining 36 chapters it's harangues and polemics all the way. An example is Dennet's fusillade at Ned Block's big idea (distinguishing phenomenal consciousness from access consciousness): "I for one found it difficult to keep track of the tangle of objections and counter objections, exemptions, caveats and promissory notes and will be interested to see if other commentators can find their way into, and back out of, the maze Block has created." Further on, "Block has done my theory a fine service: nothing could make [my theory] easier to swallow than Block's involuntary demonstration of the pitfalls one must encounter if one turns one's back on [my theory] and tries to take Block's purported distinction seriously" (p. 417). Block is capable of a similar tone: "Harman's primary argument is, as far as I can see, an appeal to—of all things—introspection . . . an error in philosophical method . . . this is no way to do philosophy" (p. 429).

There is a familiar ring to these sallies and ripostes—one hears them in court or in depositions as attorneys snap and bark at each other during the proceedings, following which they all go out for a friendly lunch together. Tyler Burge (in chapter 24) supports Block's big idea (that we have two kinds of consciousness) but he does it in a style almost entirely introspective! Burge fesses up in a fashion rarely found in philosophers: "I do not know how to defend this view. . . . But I find it compelling" (p. 429). Burge is also refreshingly frank when he says, "What is important for my purposes is not whether these empirical conjectures are correct but that the distinctions mark conceptual possibilities" (p. 433).

Conceptual analysis attains its most monarchial importance when Frank Jackson suggests that physical explanations of the mental must begin with an *a priori* account; this is another version of the view that one must *first* adopt a metaphysical position before any serious evaluation of data. (My favorite counter to this is from Sherrington, 1947, where he refers to the greatest neuroanatomist Ramon y Cajal telling how adhering at one time or another to either dualism or materialism seemed to make no difference whatever in his practical life.) In chapter 29, Jackson considers how (indeed, even whether) mental properties relate to the natural world. Thus, even though neuropsychology finds abundant evidence for mind have a physical (brain) basis, for Jackson and friends this can *never* be enough. They will insist that an *a priori* account be given *before* evidence can be considered. Like lawyers who have accepted a retainer, they know which side they are on and will not be cowed by the facts of the case.

One of the few philosophers to concern himself with physiology (in this case, of pain) is Michael Tye; but see how he does it! Tye considers one of Ned Block's pseudosyllogisms:

> *The pain is in my fingertip.*
> *The fingertip is in my mouth.*
> *Therefore, the pain is in my mouth.*

He then explains why Block is wrong (to say the word "in" is used differently for pain) using *the next nine pages*. Tye is well aware that "pains in the upper left arm are often due to disturbances in the heart." And he says, "Pain experiences, if they are anywhere, are in the head." But consider his brief reference to the elimination of distress by a frontal leukotomy (or cingulotomy): "These reports, even if taken at face value, are compatible with the proposal in the text, for clearly such cases are abnormal" (footnote 6 on p. 339). What boggles is the implication that his explanation of the normal should not be affected by data from abnormal cases (which would include much of the data from neuropsychology). Since any adequate theory of the normal should explain the abnormal, how can he not be concerned about abnormal cases?

Out at another tail end of the philosophic distribution is chapter 28 by Georges Rey, who denies that there is any such thing as consciousness, in the sense that, "there would seem to be no actual thing or process that our past usages have been 'getting at' " (p. 473). He quotes William James to the effect that consciousness is not a thing,[3] insisting instead that the word stands for a function. (Most readers of this review might agree with that.) However Rey says, "When I say there may be no such thing, I mean no such thing *whatsoever*" (p. 479). Among his 132 references there are five neuro-refs (Eccles, Luria, Moruzzi, Penfield, and Pribram) which he mentions solely for the purpose of shrugging them off. The extent to which many philosophers consider neuropsychological detail is reflected in Lycan's assertion: "The central nervous system is as central as it gets" (p. 762).

Flanagan (1992, excerpted in chapter 19) can be rewarding because he explains how other philosophers are wrong and he does it in a readable style. Unfortunately, even Flanagan reveals a surprising neuroignorance. It seems that philosophers are still devoting time to whether or not consciousness is epiphenomenal. This is the idea that consciousness is like heart sounds. The sounds can tell us some of what is going on in our hearts (just as consciousness can tell us some of what is going on in our brains) but the sounds don't have any effect on the function of the heart. To explain epiphenomenality, Flanagan contrasts two pictures: in the first, a hot stimulus to the hand causes a feeling of pain

[3]The quotation from James is in footnote 38 (repeat, 38) of Rey.

https://doi.org/10.1017/S135561770022314X Published online by Cambridge University Press

which leads to withdrawal of the limb; he calls this "the standard view." In the second, the stimulus causes the pain and the withdrawal in parallel; he calls this (correctly) the epiphenomenalist view. The fact is: the *second* has been "the standard view" for over a century. The withdrawal is a spinal reflex and the pain *is* epiphenomenal for the behavior, though likely not for the memory of the occasion (Clark & Squire, 1998).

The reader will have by now recognized some of my preconceptions about consciousness: (1) There *is* such a thing. We routinely ascribe consciousness to some entities and not others and with fairly widespread agreement. Moreover, we label *levels* of consciousness for both diagnostic and therapeutic purposes, again with fairly good agreement. (2) Consciousness is produced by brains and is to be understood (so far as we can) in naturalistic terms. Weiskrantz in *Lost and Found* thoroughly agrees with these two claims. However, there is a third preconception which he avoids: (3) Whatever the mechanism producing consciousness, it exists in duplicate. In each hemisphere exists the machinery for consciousness.

Of course, Weiskrantz know that almost all cerebral anatomy exists in pairs; it is obvious in any frontal or horizontal section of the cerebrum. However, he gives this readily observable fact short shrift and he never connects it explicitly with the problem of consciousness. Is the duality of anatomy like the runners of a sleigh, such that if one is damaged or removed the sleigh cannot go? Or is the duality more like two harnessed horses, such that if one is removed, the remaining member of the pair can still pull the sleigh, not as fast or as far, but enough. The answer unquestionably is the latter. Otherwise hemispherectomy would not be a routine procedure in 18 of 25 epilepsy centers (Engel, 1993).

Not only is the cerebral anatomy double, and not only is it unarguable that one hemisphere is enough for consciousness; beyond that, two hemispheres following callosotomy have been shown to be conscious simultaneously and independently. As Nagel (1971) said of the split-brain, "What the right hemisphere can do on its own is too elaborate, too intentionally directed, and too psychologically intelligible to be regarded merely as a collection of unconscious automatic responses" (p. 403). And, "If the patients did not deny awareness of what is being done [by their right hemispheres] no doubts about their consciousness would arise at all" (p. 404). This 1971 paper by Nagel is not included in *Debates*.

Much of the meandering inconclusiveness of discussions on consciousness results from so many different usages of the word. However, almost all usages have in common the idea of subjectivity. Hence, I believe: (4) Explaining subjectivity should have priority. Finding a physiologic basis for subjectivity is hard enough (cf. Dave Chalmers in chapter 22) without trying to explain all the other different stuff that people mean or might mean when they say "consciousness." (5) Mammalian brains have considerable power for generalized computation but *special functions* (e.g., subjectivity) *commonly require specialized structures*. Such a structure has been disparagingly called a "subjectivity pump" by Marcel Kinsbourne (1995). Well, that's *exactly* what some of us are looking for. And the mechanism for subjectivity is *double*, as shown by the duality of the anatomy, the success of hemispherectomy and the split-brain results (in cats and monkeys as well as humans).

One of the few philosophers to consider the split-brain data thoroughly was Nagel (1971). He emphasized a crucial consideration: "It may be impossible for us to abandon certain ways of conceiving and representing ourselves, no matter how little support they get from scientific research. This, I suspect, is true of the idea of the unity of a person." Having described the split-brain phenomena he continued: "It is possible that the ordinary, simple idea of a single person will come to seem quaint some day . . . but it is also possible that we shall be unable to abandon the idea no matter what we discover" (p. 411). Furthermore, "If the idea of a single mind applies to anyone it applies to ordinary individuals with intact brains, and if it does not apply to them it ought to be scrapped, in which case there's no point in asking whether those with split-brains have one mind or two" (p. 409). In fact, the idea of a single mind applies *exactly* to an individual who has had a hemispherectomy (Bogen, 1977, 1997a). But Nagel was oblivious to consciousness after hemispherectomy, and in this he has *all* of the authors in both of these books for company.

One can ask, "Will reading this book increase my understanding of consciousness?" *Lost and Found* is essential reading for those concerned with blindsight. However it can not yet answer the basic question: why do we need striate cortex to be conscious of what we are seeing? Is it because striate cortex gets back the visual information from all of the cortical areas that process visual information? Or does it send along to the other areas some special code which does not accompany the visual information that reaches extra-striate cortex directly from LGN or pulvinar? Or does striate cortex send back to some *subcortical* region something that is crucial for subjectivity? This is the alternative that I favor and it appears to be the alternative favored in *Lost and Found* in which Weiskrantz ascribes the availability to consciousness of visual information to a VORB. By VORB, he means "visual oil refinery bypass." This refers to pathways that bypass the well known block diagram of visual hierarchy proposed by Felleman and van Essen (1991), which in *Lost and Found* is called (after Cowey) the "visual oil refinery."

In Part II of *Henry VI*, Dick says, "First, . . . kill all the lawyers." Why not dispose of lawyers? Because the rule of long evolved law stands between us and reversion to the inquisition, trial by combat and the dunking of witches, who were proved innocent only if they drowned. Well then, from what primitive practices are we protected by philosophers? A likely answer: unexamined beliefs. We benefit from their exposure of unrecognized assumptions and undisciplined argument. However, to be truly helpful, they've got to know the territory. Judging by *Debates*, what many philosophers currently have to say leads less to a clarification of consciousness than to its cleverly elaborated obfuscation.

https://doi.org/10.1017/S135561770022314X Published online by Cambridge University Press

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Gate, Gate, Paragate . . . Where Have All the Flowers Gone?

Zen and the Brain. J. Austin. 1998. Cambridge, MA: MIT Press. 844 pp. $40.00.

Reviewed by Jason W. Brown, MD, New York.

Readers! Throw away your Shallice, and run to the bookstore for Austin! This magisterial work, an un-Zen-like 844 pages, divided into 158 chapters, a smorgasbord of reminiscences, data, and observations on Buddhism and neuroscience, interspersed with exercises in Zen meditation. Austin preserves by inclusion rather than selection the skepticism and dialectic that are the essence of Zen teaching, laying out what there is in all its eclectic richness, from Perky to Pavlov, from alpha rhythms to syzygy. In its scholarship and detachment it is a welcome antidote to the assertive fatuity of so much contemporary theory, offering the thesis, even if tacitly, that a subjectivism inferred from symptoms, e.g., hallucination, imagery and altered states, is preferable to an externalist model of cognition inferred from deficits.

My only quarrel with the book is that the author, though conversant, impressively so, with the puzzles, traps, and intricacies of Zen logic, seems to believe that a dialogue is possible without a radical upheaval in the presuppositional bases of western science. We crave for east–west coexistence, but the painful truth is that when we move to the metaphysical core of Zen we leave contemporary psychology far behind. Austin is more comfortable with mantras than with metaphysics, with questions, *mondos*, and replies that lead to further questions, so he visits this topic rather briefly. The result is that the implications for neuroscience of the relational standpoint of Zen are unclear, I mean, Zen as metaphysics not as experience.

For example, what does it mean for our understanding of perception to say, with the Buddhists, that a thing is the set of its contrasts, or that the awareness of a blueness is a blue awareness, that is, that the object and the apprehension of the object comprise the same state, indeed, that the object-form determines the state of awareness? Here, there is no sharp distinction of perception and hallucination (Matilal, 1986). Austin is very much in this mode of thought, and his discussion of imagery can be read with great profit. But our neurophysiology is a science of objects and in-processing in the primary cortices. What is the neurophysiology of an idealist philosophy in which objects exteriorize the valuation and conceptual feeling of mental imagery?

For Austin, meditation is the primary contact. But there is a need to go beyond the experience, to a theory of

https://doi.org/10.1017/S135561770022314X Published online by Cambridge University Press

mind in which that experience has a place. In Zen-neuropsychology, for example, the context is prior, perhaps even subsequent, to the content. How should we study the presentness of the past-gone in its near replicate? Conversely, the pastness of the present—the temporal lag in perception—entails that memory is the model of perception, and that every perception is essentially a remembrance. The past and the present—memory and perception—do not involve separate mental components or brain systems but are different aspects of the same cognition.

We owe to Aristotle a metaphysics of solid entities that interact, whether we are speaking of physical objects such as atoms, perceptual objects such as billiard balls, or cognitive objects such as propositional attitudes. The philosopher, Nicholas Rescher (1992), has written that the preoccupation with mid-size physical objects on the order of a rock, a tree, a cat, or a human being has been decisive in the history of philosophical thought. The opposing view, stretching from the Buddha to Nagarjuna and Vasubandhu in the east and from Heraclitus to James and Whitehead in the west, centers on process, time and transition, on verbs, not nouns, on events rather than things. The first (substance) approach emphasizes interaction between the causal surfaces of objects, the second (process) approach emphasizes contingency, novelty, and change.

In Buddhism, as Whitehead said, the process *is* the reality. An object is a pattern of temporal data. The data are deposited as the diachronic "sum" of the phase-transitions ingredient in the object's formation. Buddhism is a philosophy of *intrinsic relationality*, of the emptiness of continuous transition, arisings and perishings, momentary flashings, or point-instants, the nesting of illusions, where what is essential is the algorithm of the nesting, not the phenomenal contents the process lays down.

From this perspective, Buddhist philosophy is not an emollient for the excesses of functionalism but an ontology deeply out of synch with western thought. Are we prepared to reject the artificial objects that dot the landscape of cognitivist maps, acting by way of external relations on the boundaries of causal surfaces, in what the philosopher Jay Garfield (1995) has referred to as an epidemic of reification? Are there really multiple routes, nodes, and interactive components in cerebral circuit boards, or are the boxes of flow models artifacts of the arrows? And, do the arrows point to a saltatory concatenation on the example of the synapse, or is process uniform, wavelike, obligatory, and recurrent, actually a kind of organic growth?

As to Austin's theme, the centrality of consciousness, *mindfulness*, the transforming effect of meditation, and the need to study the variety of conscious and transitional states from a neuroscientific standpoint, we might wonder if the quantitative methods of experimental psychology are applicable to the study of such states? What do we learn of the inner flow of *samadhi* trance from its chemical or electrophysiological correlates? About as much, I suppose, as we learn of dream cognition from a study of REM activity (on the dissociation of REM and dream, see Solms, 1997). Austin makes a courageous attempt, but I think we need to look more closely at such neglected problems as those of subjective duration, fractals, antecedents and consequents, and whole–part transformations, if we are to make a dent in the understanding of this topic.

As an opening gambit, I would propose that conceptuality is the outcome of an evolutionary process that extends all the way down to the most basic entities, that the conceptuality in the minutest entity is the category of its durational existence, and that in the enfolding of transitions within durations, the entity exhibits, *in statu nascendi*, the conceptuality of the whole. The actualization of the entity has an aim that is satisfied when its momentary cycle is completed. All objects share this pattern, an aim toward definiteness, that is the seed of purpose. Whitehead (1926) put it nicely:

> *The lowest stage of effective mentality, controlled by the inheritance of physical pattern, involves the faint direction of emphasis by unconscious ideal aim. The transition through which this aim is realized is the duration of those phases necessary for its accomplishment. The frequency of vibration of the smallest particle encloses this duration, from its onset to its final aim, and this frequency forecasts the cycle of transition, from potential to actual, that is the line of human purposefulness. The process monism of microgenesis, and the process absolutism of Buddhism, hold that the categorical nature of conceptuality is not the Rubicon of the mental, but the divination of a world process through which every momentary subject objectifies (Brown, 1996).*

The opening citation from the Heart Sutra, "gone, gone, gone beyond," is part of my favorite mantra, and is loved as well by Austin. The gone-beyond is the ferry to another shore through the mist over the waters. We have left convention behind and entered another world. It is one we cannot visit as tourists who sample the sights and take home charming souvenirs. If we wish to truly know this world we must leave the safe harbor, the false substantiality of dry land and set out, as Dante wrote, "like a ship without a pilot on a stormy sea," and if we should take that plunge, as we must, in my opinion, if we are ever to understand these matters, we could not ask for a better guide than Professor Austin.

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https://doi.org/10.1017/S135561770022314X Published online by Cambridge University Press

The Encyclopedia on Developmental Disabilities for Developmental Pediatricians

Developmental Disabilities in Infancy and Childhood (2nd ed., Vols. 1–2), Arnold J. Capute and Pasquale J. Accardo (Eds.). 1996. Baltimore, MD: Paul H. Brookes Publishing Co. Vol. 1–630 pp., Vol. 2–529 pp. $195.00.

Reviewed by Deborah Dewey, Ph.D., *Associate Professor, Department of Pediatrics, University of Calgary, Calgary, Alberta, Canada.*

This edition of *Developmental Disabilities in Infancy and Childhood* includes two edited volumes: *Neurodevelopmental diagnosis and treatment* and *The spectrum of developmental disabilities*. This series is a good clinical reference for developmental pediatricians and other medical subspecialists in this field; however, because of its medical orientation its general usefulness to pediatric neuropsychologists and child psychologists is limited.

Volume I is divided into five parts. Part I, "The Scientific Basis of Developmental Pediatrics," presents the variety of factors that can underlie developmental disabilities beginning with a chapter that elucidates the morphological and cellular events in brain development from the embryonic period to adulthood. Following are chapters on neurodevelopmental disorders resulting from disturbances in brain development during each major period of development; and the importance of understanding synaptic neurochemistry and the metabolic activity of the brains of children with developmental disabilities. Genetic factors associated with developmental disabilities are discussed in chapter 4; chapter 5 focuses on the more common classes of metabolic diseases encountered by pediatricians who evaluate children with undiagnosed motor, cognitive, or behavioral disability. The final chapter reviews the epidemiology of developmental disabilities and includes a discussion of difficulties in case definitions and methods of case ascertainment.

Part II addresses six etiologies of developmental disabilities. The chapter on prematurity provides a basic review of the developmental outcomes of preterm infants. N.J. Roizen and D. Johnson discuss the epidemiology, clinical manifestations, diagnosis, treatment, and prevention of various congenital infections, including cytomegalovirus, neonatal herpes simplex, congenital rubella, congenital syphilis, congenital toxoplasmosis, and fetal varicella. A separate chapter on pediatric neuro-AIDS updates health measures and treatments used to prevent the transmission of HIV to the fetus and reports on the neurodevelopmental disabilities associated with pediatric HIV infection. The chapter on "Infants of Substance-Abusing Mothers" discusses the pharmacology of cocaine, heroin, marijuana, and phencyclidine during pregnancy, the perinatal and neonatal effects of exposure to them, and the long-term outcome of prenatally exposed infants. (Prenatal exposure to alcohol and its long-term outcomes were not addressed in this chapter; however, in Volume 2, chapter 19 is devoted to Fetal Alcohol Syndrome.) J.R. Christensen's review of pediatric traumatic brain injury and its sequalae is very brief and somewhat limited.

Part III covers the fundamentals of a pediatric developmental assessment and is primarily of interest to developmental pediatricians or pediatric residents. It begins with a discussion of whether fetal assessment may cause long-term neurodevelopmental problems and whether it is useful. Then come chapters on the developmental history, the dysmorphology examination, and neurodevelopmental examinations of neonates, infants, and young children. In chapter 18, H.M.E. Becker reviews the basic principles of developmental screening and discusses the strengths and weaknesses of some of the more widely used screening instruments. Chapters 19, 20, and 21 describe commonly used measures in neurodevelopmental, psychological, and functional assessment of children with developmental disabilities. The final chapter focuses on the uses and limitations of neuroimaging with these children.

The fourth section of Volume I focuses on the roles of the physician and other health care providers in providing assistance to and services for children with developmental disabilities and their families. Chapter 24 discusses the interdisciplinary team approach to evaluation and treatment of children with disabilities and summarizes the roles of various team members. B.A. Myers, in chapter 26, reviews the issues that surround parental coping with and adaptation to developmental disabilities. A detailed account of the stresses and coping processes associated with mental retardation is presented, followed by shorter discussions on seizure disorders, learning disabilities, attention-deficit/hyperactivity disorder, autism, spina bifida, and cerebral palsy. The final chapter here addresses the role and challenges that developmental pediatricians face in residential treatment facilities.

Part V, "Issues in Patient Care," contains 7 loosely related chapters. Chapters 28 and 29 deal specifically with American laws and issues. A chapter on the efficacy of early intervention programs is very informative. Other topics include the transition from pediatric to adult health care for persons with disabilities, the use of computer technology in the assessment and treatment of these children, nonstandard therapies in developmental disabilities, and special ethical issues.

Volume II focuses on developmental disabilities commonly seen by developmental pediatricians, with emphasis on the clinical manifestations of the disorders—including their psychological and neuropsychological features—and

https://doi.org/10.1017/S135561770022314X Published online by Cambridge University Press

their medical diagnosis and treatment. In this seven part volume, Part I, "The Continuum of Motor Disorders and Disorders of Higher Cortical Function," includes an interesting but somewhat sobering discussion of the relationship between fetal life and developmental disabilities by C. Amiel-Tison. This is followed by chapters on the development of motor functions and behavior in the fetus and preterm infant, and the neuroanatomical basis of mental retardation and learning disabilities. Parts II and III deal specifically with developmental disorders of motor function. Part II provides an excellent overview of cerebral palsy and its medical management issues. Part III reviews conditions such as neuromuscular disorders, spina bifida, hydrocephalus, and mild neuromotor disabilities. Chapter 12, on childhood-acquired hydrocephalus, has a section on the neuropsychological functioning of these children with a brief discussion of the specific domains in which these children display deficits. The diagnosis and management of children with mild neuromotor dysfunction is discussed, plus the relationship between motor dysfunction and learning disabilities. Part IV discusses mental retardation from the perspective of the medical model and reviews the most common genetic causes (i.e., Down, Prader-Willi, Fragile-X, and Williams syndromes). It also contains a chapter on psychiatric problems in people with developmental disabilities, including the diagnosis and treatment of psychiatric disorders in people with mental retardation.

In part V, developmental disorders of language and communication are reviewed with a specific emphasis on children with autism or related disorders such as Asperger's syndrome, Pervasive Developmental Disorders, and Rett's syndrome. Part VI focuses on disorders of learning and attention. Both of these sections focus on diagnosis and treatment and the role of the pediatrician in managing these disorders. The neuropsychological basis of these disorders is reviewed in a cursory fashion except for dyscalculia (chapter 27). Part VII includes chapters on disorders of visual impairment, hearing loss, Tourette's syndrome, and epilepsy, addressing issues of diagnosis and management of children with these disorders from the perspective of a developmental pediatrician.

As the editors emphasize and one can note from the authors list, this is a publication that is written by physicians for physicians, specifically, neurodevelopmental pediatricians. As a general reference, neurodevelopmental pediatricians, medical residents and fellows may find this publication to be of use. However, it is definitely not an essential acquisition for neuropsychologists or clinical pediatric psychologists.

Speaking for Language-Impaired Children

Children With Specific Language Impairment, L.B. Leonard. 1998. Cambridge, MA: The MIT Press. 339 pp., $60.

Reviewed by Paula Tallal, Ph.D., *Professor, Co-Director of the Center for Molecular and Behavioral Neuroscience, Rutgers University.*

Larry Leonard's new book, *Children With Specific Language Impairment*, has the potential to become the definitive text and scholarly resource for students, clinicians, and scientists concerned with these children. This six-part book (comprising 14 chapters) provides a complete, detailed, and even-handed review of the multidisciplinary research in this field.

The first sections of the book focus on the characteristics of children with specific language impairment (SLI) derived from both clinical observation and etiological research. Research on the etiology of language disorders is meticulously cited and reviewed in four separate chapters. Different dominant theoretical positions, specifically those focused on linguistic as opposed to nonlinguistic mechanisms contributing to the etiology of SLI are carefully explained, accompanied by the relevant data supporting or refuting each theory. Leonard has clearly gone to great lengths to write both an unbiased and comprehensive discussion of the major theoretical issues in this field, including not only the most frequently cited and most recent studies, but also an impressive number of often forgotten or difficult to find older or more obscure papers and book chapters. As a result, this section of the book provides the most comprehensive review to date of research pertaining to the etiology of SLI.

Leonard's own cross-linguistic research on SLI provides not only some of the most creative research in the field, but more importantly, some of the most critical data pertaining to alternative competing linguistic *versus* nonlinguistic hypotheses. As Leonard states (chapter 4, p. 87), "In English, most of these competing hypotheses seem equally plausible. However, data from children with SLI learning other

https://doi.org/10.1017/S135561770022314X Published online by Cambridge University Press

languages say something different. In some cases, the languages studied suggest alternative hypotheses that might not have been considered on the basis of English data alone." Importantly, studying the characteristics of linguistic deficits in children learning languages other than English results in interpretations that are quite different from widely held interpretations based on English data alone. Focusing on linguistic deficits, Leonard concludes that "if there is a universal feature of SLI, apart from generally slow and poor language learning, it is well hidden. In any given language, children with SLI might show areas of extraordinary weakness. But these areas will vary from language type to language type" (chapter 4, p. 117). However, Leonard meticulously shows that what does seem consistent across languages is the finding that whatever linguistic morphemes are brief, weak, and phonetically nonsalient, are the most problematic for children with SLI in that language.

What is important about these cross-linguistic findings is that they provide a basis for unifying linguistic and nonlinguistic theoretical positions, previously seen as competing hypotheses. Leonard approaches this unification in Part V of the book, which is focused on theoretical issues. Here Leonard does a masterful job of integrating data across the various approaches that have been taken in the study of SLI (linguistic, neuropsychological, neurophysiological, genetic, clinical). He makes a strong case for viewing SLI as a limitation in processing capacity, noting that in the cognitive literature, limited processing capacity is discussed in terms of space, energy, or time constraints. Within this framework, Leonard makes a strong case that much of the data pertaining to SLI, both linguistic and nonlinguistic, is parsimonious with a limitation in processing rate. This reduced speed of processing hypothesis accounts for much of the data derived from linguistic (especially cross-linguistic) studies, both in terms of perception and production. Focusing on what has come to be called the "surface hypothesis," Leonard carefully reviews the case that acoustic properties of speech, especially those of short duration relative to adjacent material, make specific structures of language (for example, grammatical morphemes and inflections) more difficult to learn, and are particularly problematic for children with SLI.

A general limitation in processing rate is also highly consistent with what has come to be known as the "temporal processing deficit" hypothesis. Leonard notes, "among the most enduring findings in the literature on SLI is the finding that children with SLI perform quite poorly on tasks requiring the processing of brief stimuli and the processing of stimuli that are presented in rapid succession . . . Tallal and her colleagues have been the dominant researchers in this area, and have interpreted these data as reflecting a temporal processing deficit in children with SLI" (chapter 13, p. 274). However, having made a strong case in chapter 12 for a general limitation in processing rate being compatible with much of the linguistic as well as nonlinguistic data pertaining to SLI, it is surprising to find "temporal processing" included in chapter 13 as a much more narrowly focused, specific mechanism. This confusion derives from quite different uses of the term "temporal processing" by scientists in different fields. For speech scientists and psychoacousticians, "temporal" refers to one of the basic measurements along which sound can be analyzed, the other two being spectral (frequency) and amplitude (intensity). Here "temporal" means duration. However, to neuroscientists and neuropsychologists "temporal processing" is one of the major organizing principles in the brain, that is, the processing or production of information dynamically over time, as contrasted with "spatial processing," for example. When applied to the study of SLI, these semantic differences in the use of the term "temporal processing" lie at the heart of current controversies, particularly as they pertain to "temporal processing deficits." Such deficits are interpreted as reflecting neural processing rate constraints by researchers like Merzenich and me, who come from a neuroscience perspective. In contrast, they are much more narrowly focused on the measurement of acoustic components (including those within speech) by speech scientists and psycholinguists, such as Studdert-Kennedy and Rice. Throughout my research, I have explicitly used the term "temporal processing" as synonymous with rate of change, or dynamic change over time but not in the narrower sense pertaining only to the durational cues in speech. As such, my hypothesis is entirely consistent with Leonard's view of a general rate processing limitation. To further support the generality of this deficit, I have shown that the rate processing constraint is "pansensory." That is, it occurs across sensory modalities, affects the rate of producing fine motor movements as well as perceiving brief, rapidly successive sensory stimuli, and affects both linguistic as well as nonlinguistic processing. Recently, my colleagues and I have further shown that remediation strategies designed to ameliorate the processing rate constraints of language learning impaired children are highly effective, not only in speeding up these children's neural processing rate, but also significantly improving their speech perception and language abilities as well.

The final section of this book focuses on implications for clinical and educational intervention. The competing accounts of SLI clearly have important implications for both diagnosis and treatment, as different interpretations of the data suggest different areas of emphasis for treatment. Leonard concludes that "treatment can be thought of as presenting the child with an ideal input, in which material to be learned appears more frequently in a more interpretable manner" (chapter 14, p. 285). In order to determine what the ideal input is that will lead to the most effective interpretation of material to be learned, it is essential that we understand the processing strengths as well as constraints of children with SLI. It is also essential that we understand better how the brain processes and learns to represent information at the physiological level in order to develop more effective therapeutic (learning) strategies for these children. Leonard's book should help guide future research as well as clinical practice in this pursuit.

https://doi.org/10.1017/S135561770022314X Published online by Cambridge University Press

OTHER BOOKS OF INTEREST

Naglieri, J.A. (1999). *Essentials of CAS assessment.* New York: John Wiley & Sons. 205 pp., $29.95 (PB).

Kaufman, A.S. & Lichtenberger, E.O. (1999). *Essentials of WAIS–III assessment.* New York: John Wiley & Sons. 260 pp., $29.95 (PB).

The description of the contents on the cover of each of these manuals tells the potential buyer what is inside, *viz.* "Complete coverage of administration, scoring, interpretation, and report," "Expert advice on avoiding common pitfalls," and "Conveniently formatted for rapid reference." A fourth item appears on the Naglieri manual: "Guidelines for interventions included."

https://doi.org/10.1017/S135561770022314X Published online by Cambridge University Press