NO, thereby relieving chronic angina; the identification of histo-
chemical NADPH diaphorase reaction in brain as NO synthetase; 
how stimulation of excitatory pathways in brain stimulates the for-
mation of cGMP, where NO is the intracellular messenger; and why 
in septic shock and chronic inflammatory disorders an excess of 
nitrate is excreted in the urine. The three isoforms of NO syn-
thetase, Type I, II and III, and their genes, are clearly described. 
Section 2, which contains three chapters, covers the pathological 
implications of NO, and should be required reading for all students 
preparing for fellowship examinations in neurology, medicine and 
surgery. A unique aspect of this book is the inclusion in Sections 3 
and 4 of experimental approaches, protocols, and techniques used 
for the measurement of nitric oxide. These are very helpful to any 
researcher wishing to venture into this new field.

This book, in paperback and inexpensive, is highly recommend-
ed to all graduate students, clinicians, and pharmacologists. It is by 
far the best introduction to this unique new field of research. The 
biochemistry may be somewhat densely written but is worth the 
added effort. The figures are clear and informative. There is a help-
ful glossary, and the two appendices are comprehensive tables 
of the distribution of constitutive NO synthase as determined by 
immunohistochemical study of peripheral tissues in which nitric 
oxide is identified as a neurotransmitter. Finally, research on the 
basic mechanisms and role of nitric oxide in health and disease is 
not static, and new discoveries are bound to appear in the future.

Leonhard S. Wolfe, 
Montreal, Quebec

SC78.00

For years, neurobiological models of dreaming have been found-
ded primarily upon animal-based research; research whose validity 
for this task is as uncertain as whether or how animals might dream. 
On the other hand, although the dreams of brain-damaged patients 
could provide much pertinent information about the brain’s role in 
dream formation and recall, little systematic work has been accom-
plished in this area. With some exceptions1, most of the available 
literature consists either of clinical descriptions of patients with 
diverse brain lesions or of selective reviews of these cases.2

Solms’ The neuropsychology of dreams has almost single-hand-
edly transformed this situation. The work is a masterful systemat-
ization of past and current research literature, an unveiling of a large 
sample of new patients, and a lucid theoretical statement on the 
human neurobiology of dreaming. The consequence of this work 
may well be to reinvigorate and reorient what has been a relatively 
sluggish and disorganized area of study.

Solms anchors his work in a 3-chapter review of the Charcot-
Wilbrand Syndrome, of the research that was provoked by this syn-
drome, and of the necessity for distinguishing in this literature 
between (a) cessation or restriction of visual dream imagery and (b) 
global cessation or reduction of dreaming per se. He follows up this 
introduction with chapters reviewing the “neglected psychosurgical 
literature” and other abnormalities of dreaming previously dis-
cussed in the literature. This prepares the way for presentation of 
the “18 hypotheses” tested with his sample of 361 neuropsychologi-
cal cases. These hypotheses are relatively specific in nature, e.g., 
Hyp #2: Cessation or restriction of visual dream-imagery indicates 
a bilateral lesion in the medial occipito-temporal region, or Hyp 
#14: Increased vivacity and frequency of dreaming indicates a 
lesion (usually but not exclusively bilateral) in the anterior parts of 
the limbic system, or Hyp #17: Recurring nightmares indicate a dis-
charging lesion in the region of the right temporal lobe, etc.

Solms’ 361 cases were assessed during “routine clinical work” 
over a span of 4 years. They consisted primarily of patients with 
cerebrovascular disease (N = 83), neoplasms (N = 79) and trauma 
(N = 108) and included the entire spectrum of neurobehavioral 
symptoms (but primarily anosognosia, disinhibition, disturbed prob-
lem-solving, perseveration, adynamia and apraxia) and brain lesions 
(all major lobes are represented in the sample). All patients were 
administered a structured interview about changes in dreaming as a 
result of their neurological illness, including questions concerning 
sleep, dream recall, narrative complexity, emotional intensity, recur-
ring nightmares, visual imagery, dream vivacity, and reality confu-
sion, among others. Responses were also compared with a matched 
control group of 29 patients tested for suspected cerebral illnesses 
that were eventually ruled out. Anatomical findings were available 
in the form of CT and MRI scans projected onto standardized tem-
plates; these allowed statistical assessments with chi-square and dis-
criminant analyses.

The bulk of the remainder of the book consists of detailed 
descriptions of results. Although too numerous to summarize in 
this short review, Solms marshals substantial evidence that the 
recall and formation of dreaming is affected by neurological dam-
age. In general, 337 of the patients (or 93.4%) reported having 
undergone a change in some aspect of their dream experience as a 
function of their neurological condition. Of these patients, 321 
responded to a question concerning global cessation of dreaming 
(GCD) with 112 (or 34.9%) reporting that they had ceased dream-
ing since the onset of their neurological illness. This global change 
could be traced to parietal lobe involvement in almost half of the 
cases with equal distributions of right- and left-side lesions in 45 of 
47 cases. Such results challenge the current notion that dreaming is 
lateralized to the left-hemisphere (e.g., left-infero-mesial occipi-
totemporal cortex).1

This section of the book is also rich in descriptions of more spe-
cific. sometimes highly fascinating, dream disturbances. For example, 
the phenomenon of dream-reality confusions was identified in 
5.3% of patients. Here, dreams become much more vivid and 
intense than even the most vivid of patient’s normal dreams and can 
produce great distress. Solms discusses the hypothesis that such 
confusions are due to localized anterior limbic lesions, however, no 
one specific pattern of lesions has yet emerged. Other interesting 
abnormalities discussed are reduced frequency of dreaming, 
reduced narrative complexity and emotional intensity of dreaming, 
and increased frequency and vividness of dreaming.

In a final chapter, Solms offers readers insights into the dream-
ing process based on human subjects. He proposes a model of nor-
mal dreaming that depends upon activation of an appetitive 
program (curiosity – interest – expectation) formulated by 
mediobasal-frontal mechanisms. This appetitive program is trans-
formed into the hallucination of dreaming via a 3-stage process: 
(a) it is represented symbolically by left parietal mechanisms, (b) 
it is re-represented concretely (spatially) by right parietal mecha-
nisms, and (c) it is converted into a “complex kinematic visual 
perception” by bilateral occipito-temporal mechanisms. 
Bizarreness of the experience is caused by a lack of external stim-
ulation (implicating noninvolvement of primary visual cortex)
and of executive functions (implicating lack of dorsolateral frontal involvement). This model appears to support an animal-based model of dreaming that hypothesizes "orientational" functions (interest, surprise, startle) for central PGO activity\(^5\) much more than it does a model proposing PGO to be a random, chaotic process.\(^6\)

Some minor, stylistic features of the work deserve mention because they reflect the author's general eye to detail. One is the generous use of tables to organize materials, be they collections of prior studies on a given theme, or sub-samples of patients from his own collection with similar symptoms. These tables allow the reader to easily size up the relative weight of evidence for a topic and to make easy comparisons between patient groups. A second noteworthy feature is a glossary of nosological terms which gives the less neurosavy reader easy access to definitions of highly specific terms used in the book (e.g., irremiscence, adynamia, anosognosia, etc).

Are there problems with this book? Yes, at least two that deserve mention, but neither of which is damaging enough to exclude the book from any reader's shelf. One is that most of the case descriptions and statistical analyses reported have nowhere first been published in peer-reviewed journals. Thus, the scientific value of most of the findings has not been established via the usual empirical channels and must remain uncertain. A second problem is that the author has not considered the most recent brain imaging studies of REM sleep and dreaming in his formulation of a dreaming model. Although these studies are consistent with his thinking on many points, on many others it is not an unfortunate oversight because of the potential value such studies will have in independently validating or failing to validate his ideas.\(^4\)

In sum, Solms has produced a rare work that is as original and useful as it is comprehensive and well-organized. It is surely one of the most important books on dreaming to appear in the last 25 years, and by far the most important work on dream neuropsychology to have been published. The book will likely come to be considered essential reading for students of sleep medicine.