Mind and Measurement: Review of Daniel Algom (ed.), *Psychophysical Approaches to Cognition*

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A salient theme that emerges from almost any academic review of the history of psychological science is the tendency for certain research traditions and paradigms to develop independently, with relatively little crosstalk. Such has been the case with the classical psychophysical tradition and the much younger subdiscipline of laboratory cognitive psychology. The present edited volume (part of the “Advances in Psychology” series from North-Holland) contains 10 chapters, each of which addresses some aspect of the historical, existing, or future potential relationships between psychophysics and cognition. Given the diversity of research and theoretical interests among the 12 contributors to this volume, it is not surprising that the chapters differ in the relative emphasis they place on historical and philosophical analysis, advancement of theory, and review of empirical research. However, it is clear from the editor’s remarks in the Preface that these chapters were indeed intended as “self-contained” (p. v) units, albeit within the broad theme of integrating psychophysical theories and methods within the domain of cognition.

Although the volume title implies that the primary theme will be to examine applications of psychophysical techniques to the study of cognition, the first three chapters are somewhat more concerned with the cognitive nature of psychophysical judgment itself. Anderson’s chapter, titled “Integration Psychophysics and Cognition,” is aimed at advancing both a theoretical perspective and methodological approach—information integration theory and functional measurement. This comprehensive, eight-section chapter provides a sufficiently detailed development of both theory and methods that readers not previously familiar with Anderson’s perspective and approach will find informative and thought provoking. Anderson provides clear descriptions of empirical applications involving a diverse set of research problems and settings, ranging from sensory evaluation (e.g., brightness judgment) to the more cognitive topics of memory psychophysics and attributions of causality. Because a major function of a volume such as this should be to stimulate creative thinking within a subject area, it is very useful to present examples of limitations of an approach and to discuss unresolved problems. This chapter accomplishes both these goals as well.

Marks’s chapter, titled “ ‘What Thin Partitions Sense From Thought Divide’: Toward a New Cognitive Psychophysics,” is even more directly aimed at cognitive influences on psychophysics per se than is Anderson’s chapter. After tracing the roots of modern thinking about perception and psychophysical measurement from ancient Greek philosophy to the present, Marks presents an excellent overview of research on context effects in psychophysical judgment, concluding with a strong plea for a pluralistic and cognitively based approach to psychophysics.

Ward’s chapter, titled “Mind in Psychophysics,” continues the theme that psychophysical judgment is best viewed in a pluralistic, cognitive framework. However, the theme is developed largely through a critical analysis of modern multidisciplinary views of the role of the mind (e.g., Minsky, Bechtel, and Dennett, to name a few), rather than from issues presented from empirical data. As such, Ward’s chapter nicely complements the previous chapter by Marks. As with Marks’s chapter, however, Ward’s chapter is more concerned with the cognitive nature of psychophysics than with the application of psychophysical theory or procedures to the assessment of cognitive structure or representation.

With the exception of the final chapter, which returns to issues concerning sensory evaluation, the re-

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Daniel Algome (ed.), Psychophysical Approaches to Cognition
maining chapters each address a
theme that links a psychophysical ap-
proach with the study of cognitive
representations. Galanter’s contribu-
tion, “Intentionalism—An Expressive
Theory,” is concerned with psycho-
physical analysis of choice behavior.
This chapter develops and provides
elements of a general scaling proce-
dure, *modulus estimation*, that is pro-
posed as a tool for assessing utility
based on equivalence matching with
previously psychophysically scaled
material. Galanter’s contribution is,
nevertheless, as much theoretical as
it is oriented toward proposing a gen-
eral measurement tool, because it is
presented in the context of a gen-
eral motivational theory of expres-
sive behavior. From a more empirical
standpoint, however, some intriguing
suggestions are made about the appli-
cation of the modulus estimation tools
to the investigation of how utilities of
individual components of a decision
path are combined or integrated to
determine overall utility of that path.

The next chapter, by Melara, is an
extremely well-presented discourse
on a central concept of perceptual
and cognitive structure—similarity.
Many widely used scaling and mea-
surement procedures for assessing ei-
ther perceptual or representational
structures make implicit assumptions
about similarity, such as its relation-
ship to performance and the metric by
which stimulus differences along sepa-
rates dimensions are integrated to pro-
duce psychological distances among
stimuli or concepts. Melara provides a
concise, thoughtful, and readable his-
torical analysis of how similarity has
been treated historically, moving from
Fechnerian psychophysics through the
contributions of Thurstone, Attnavee,
Torgerson, Shepard, Kruskal, and oth-
ers. This historical analysis leads to
the presentation of a personal view about
the concept of similarity that sets forth
a presumably testable (but as yet not
rigorously tested) model concerning
integration of stimulus dimensions.
The speculative theme with which the
chapter concludes is to its credit; it
should stimulate new thinking and re-
search on a very fundamental issue in
perception and cognition.

Baird and Hubbard address the
topic of mental imagery and the ex-
tent to which psychophysical assess-
ments traditionally applied in the per-
ceptual domain (to actual observed
stimuli) can be applied to assessment
of the structure of imagined stimuli or
events. Both the Baird and Hubbard
chapter and the following chapter by
Algom, titled “Memory Psychophys-
ics,” recognize that, although the study
of memory and imagery have evolved
from research traditions somewhat iso-
lated from that of sensory psychophys-
ics and have thus developed different
approaches and tools to make infer-
ences about mental structure, each dis-
cipline can clearly benefit from the
sharing of research tools. Such an ap-
proach can be particularly useful in
determining the degree of structural
equivalence between perceptual and
remembered (or mentally created) rep-
eritations of stimuli.

The chapter on pain research by
Rollman provides an interesting over-
view of how an extremely important
quality of human experience (but one
that is exceedingly difficult to mea-
sure or even define in a noncircular
manner) can be systematically ex-
plored by psychophysical methods.
Pain is both experienced and remem-
bered and is controlled by both sen-
sory and contextual events. Rollman
provides an excellent layout of issues
concerning the separation of sensory
versus cognitive and emotional com-
ponents providing many useful illus-
trations of the confounds and ambi-
guities inherent in previous laboratory
work on this topic. Despite the short-
comings of much of this reviewed re-
search, Rollman concludes with the
strong view that in assessment of pain
for either clinical, diagnostic, or re-
search purposes, behavioral (i.e., psy-
chophysical) responses encompassing
“numbers, words, and matches” (p.
564) constitute a superior approach to
that provided by purely physiological
measures.

The final chapter of the volume by
Gescheider, Bolanowski, and Verillo
is more focused on methodological is-
issues inherent in measuring sensory
magnitude than on the interface with
more cognitive issues. Although Nor-
man, Marks, and Ward, each in their
own way, stress the unavoidable and
perhaps inseparable cognitive compo-
nent to sensory measurement, this fi-
nal chapter returns to the perspective
that measuring sensory magnitude per
se is of value and that, given appropri-
ate measurement procedures, it can be
adequately accomplished with a min-
imum of contextual biases that could
cause comparisons between experi-
ments and settings to be uninterpre-
table. In my view, it would have been
better to place this chapter after those
of Marks and Ward, because it does
address the general issue of context ef-
effects. As currently placed, however,
this chapter is somewhat difficult to
integrate with the themes of the imme-
diately preceding chapters.

Other than the minor chapter place-
ment issue mentioned above, my only
other criticism is to question whether
the volume title adequately encom-
passes the breadth of the contents. As
indicated earlier, the initial chapters
of the volume are deeply concerned
with the fact that psychophysical judg-
ment is by nature a cognitive task—e
when applied to sensory evaluation.
The application of cognitive principles
to produce a better understanding of
sensory judgment, as well to improve
psychophysical measurement tech-
niques, is such an important theme
in several chapters that it would have
been nice to have it reflected in the vol-
ume title.

In summary, I believe this volume
will stimulate new research ideas, pro-
vide readers with some unique histori-
ical and philosophical perspectives, and
raise important basic theoretical issues
about both measurement and cogni-
tive structure. Additionally, several of
the chapters provide useful topical re-
views (e.g., Baird and Hubbard on im-
agery, Algom on memory psychophys-
ics, and Rollman on pain). The volume
makes a compelling case that cognitive
effects are an important component of
psychophysical judgment even within
the sensory realm and that psycho-
physical techniques can and should be
used to tell us more about aspects of
cognition. Whether the latter message
will be heard by those cognitive psy-
chologists who, according to Algom,
view sensory psychology as “the last
bastion of fixed mechanistic (i.e., psy-
chologically trivial) properties, best left
to those unprepared or uninterested
enough to deal with real psychology”
(p. 10), remains to be seen.