

Valentino Braitenberg · Almut Schüz
Cortex: Statistics and Geometry of Neuronal Connectivity

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Second thoroughly revised edition

With 90 Figures



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*To our relatives, the Rodents,
with apologies*

Thanks

(from the preface to the first edition)

This book describes a collective effort in which our whole group at the Max-Planck-Institute for Biological Cybernetics in Tübingen was involved. We are unable to formulate separate eulogies for those of our friends who did the laboratory work and for the others who helped us in the analysis, for there was no clear distinction between them. Some of our technical staff co-authored the papers with us, and the others will in due course. All of them, Monika Dortenmann, Annette Münster, Volker Staiger and Claudia Martin-Schubert participated in our discussions and made essential contributions ranging from the invention of staining methods, through measurements at the microscope, to truly original observations, not to mention their attentive search of the literature in which our group was less defective than our (selective rather than exhaustive) quotations would suggest. Conversely, the mathematician (now professor) Günther Palm did not find it beneath him to check on the minutiae of our counts and measurements, or even sometimes to lend his own eye to them. With Ad Aertsen and his cohort involved in the statistical analysis of electrophysiological data the exchange of ideas was continuous, and certainly some ideas arose as common modes of oscillation in a coupled system involving all of us. Some other ideas were not common modes, but unilateral flow: we received much instruction and advice from our mathematically competent colleagues, and over the years Günther Palm's tutoring was especially helpful.

We owe special thanks to Horst Greilich, Bernhard Hellwig and Michaela Schweizer for letting us use some material from their unpublished academic theses.

Several people read parts or all of our text before it was too late to incorporate their criticism. Shirley Würth and Margarete Ghasroldashti were the first linguistic filters and watched over the form of the manuscript. Shirley was strict and British but we have sometimes evaded her dictate. Elisabeth Hanna-Braitenberg was also consulted and gave stylistic advice (hers more American), especially for the first and the last three chapters. These were also read by Ad Aertsen and Hubert Preißl, whose comments referred to our style of thinking, and were gratefully received by us.

But especially we are grateful to our colleagues abroad whom we had asked for advice and criticism. Professor Ed White in Beer Sheva read one chapter and gave us his candid opinion in several sanguine missives

full of valuable information. This was in continuation of a discussion we had had before at a symposium where the truth was spotlighted by our opposite beams. Professor Alan Peters in Boston took upon himself the chore of editing the book, which meant adapting some of our idiosyncratic expressions to the established usage in cortical neuroanatomy. We are exceedingly grateful to him and have followed most of his suggestions. Not all of them: approaches from different angles make the reality break open in different ways, and we thought it useful to preserve the rough edges.

Margarete Ghasroldashti and Claudia Martin-Schubert produced, with admirable skill and patience, the camera-ready copy for the publisher. We are particularly grateful to Hubert Preißl for his expert tutoring in these matters.

All of the art work, and much of the photographic work was done by Claudia Martin-Schubert: she grasps ideas and finds the most effective pictorial form.

Thanks

(added to the second edition)

We are grateful to colleagues, students and librarians who, by their continuing requests, prompted us to prepare a second edition. Many thanks to Dr Czeschlik, Dr Lindenborn and Dr Farrar, our friendly mentors at Springer Verlag, who agreed to publish the book again in a more distinguished format.

This time assistance in matters of organization and word processing was provided by Dorothee Kühnel, to whom we owe much gratitude for her friendly patience and great skill.

* * *

We can wholly dismiss as unnecessary the question whether the soul and the body are one: it is as meaningless as to ask whether the wax and the shape given to it by the stamp are one, or generally the matter of a thing and that of which it is the matter.

Aristotle, *On the soul*

Were ideas entirely loose and unconnected, chance alone would join them; and it is impossible the same ideas should fall regularly into complex ones (as they commonly do), without some bond of union among them, some associating quality, by which one idea naturally introduces another.

Hume, *A Treatise on Human Nature*

For the same things can be thought as can be.

Parmenides

I would especially direct attention to that view of the constitution of the intellect which represents it as subject to laws determinate in their character, but not operating by the power of necessity; which exhibits it as redeemed from the dominion of fate, without being abandoned to the lawlessness of chance.

Boole, *An Investigation of the Laws of Thought*

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