

Preface

Upon the 50th anniversary of the University of Science and Technology of China, we dedicate this book, on behalf of all the contributors, to our alma mater to celebrate her many achievements in scientific research and education, and to express our gratitude for the life-changing experiences and opportunities we gained as her students.

Contributors of the book include three groups of USTC alumni: (1) Graduates (BS) of the Biophysics Major in the 1950s and 1960s, who later became vision science researchers. A few of them, Professors Shou Tiande, Chen Lin and Zhang Daren, established the vision science program at USTC in the 1980's. Over the last quarter-century, hundreds of undergraduate and graduate students have completed theses or dissertations in their labs; many more have taken their vision science courses. (2) Graduates from Professors Shou, Chen and Zhang's labs. Many of them have become outstanding vision science researchers. Their success reflects the far-reaching influence of the vision science program at USTC. (3) Graduates of other units of USTC who have developed research careers in vision science after they left USTC. Their successful venture into vision science reflects the solid fundamental scientific training and self-confidence provided by all the educational programs at USTC. We are extremely pleased that this distinguished group agreed to contribute their chapters and bios to this book honoring our Alma Mater USTC.

Our editing process began by inviting authors to provide a short selection of their best and representative publications. From this impressive collection of more than 100 papers, with the page limit set by the publisher, we carefully chose 25 chapters to reflect the broad field of vision science. The book is

organized in a coherent manner with two major sections: I. Visual Neuroscience, and II. Visual Perception and Cognition. The six chapters in Subsection IA Pre-cortical Processing cover topics on restoration of photoreceptor degeneration (Chapter 1), modification of the retino-tectal system (Chapters 2 and 3), receptive field properties of retinal ganglion cells (Chapter 4) and LGN cells (Chapter 5), and feedback from visual cortex to LGN (Chapter 6). The nine chapters in Subsection IB Cortical Processing cover topics on pattern and motion processing in visual cortex (Chapters 7, 8 and 9), mapping of visual space and response features in visual cortex (Chapter 10), effects of attention (Chapter 11), perceptual learning (Chapters 12, 13, and 14), and aging (Chapter 15) on cortical processing. The three chapters in Subsection IC The Ocular-motor System focus on response properties of ocular-motor neurons (Chapters 16 and 17) and the reliability of the ocular-motor command signals (Chapter 18). The seven chapters in Section II cover basic visual perceptual processes such as the resolution of the early visual pathway (Chapter 19), distance perception (Chapter 20), perception of isoluminance chromatic motion (Chapter 21), perception of topological structures (Chapter 22) and feature grouping (Chapter 23), computational vision (Chapter 24), and visual working memory and decision making in honey bees (Chapter 25). With a collection of excellent readings that nearly cover the entire visual pathways, we believe this volume would be a suitable supplementary reading to expose upper-level undergraduate and graduate students to the various topical areas in vision science.

We are grateful to all the contributors and many other people who have given us a great deal of help and confidence in producing this book. In particular, we thank Xiangrui Li for his help in translating the Preface into Chinese and USTC Press for their encouragement and cooperation. Editing this volume has also been a rewarding experience for all of us. We have not only learned a great deal from our teachers, schoolmates, and colleagues, but also established new friendship and bonding with them. Furthermore, in the process of editing this volume, we have become aware of many important developments of younger generation vision scientists from USTC. We envision

that we will have the opportunity to include their excellent work in a new edited volume in the near future.

Happy 50th Birthday, USTC!

Zhong-Lin Lu, Irvine, California, USA

Yifeng Zhou, Hefei, Anhui, China

Sheng He, Minneapolis, Minnesota, USA

Zijiang He, Louisville, Kentucky, USA

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值此中国科学技术大学 50 周年校庆之际,我们代表所有作者,谨将此书献给我们的母校,以庆祝她在科研和教学方面取得的丰硕成果,并感谢她给予我们终生受用的经历与机会。

本书的作者包括三类科大校友。(1) 上世纪五、六十年代生物物理专业的本科毕业生,后来发展为视觉科学家。其中寿天德、陈霖和张达人教授在八十年代启动了科大的视觉研究。在二十多年的时间里,数百名本科生和研究生在他们的实验室完成了毕业论文,更多的学生选修了他们开设的视觉科学课程。(2) 寿天德、陈霖和张达人实验室的毕业生。他们中的许多人已成为出色的视觉科学家。他们的成功反映了科大视觉研究与教育的深远影响。(3) 科大其他系科的毕业生,他们离开科大后进入视觉科学领域。他们在视觉领域取得的成果反映了科大给予他们的坚实的基础科学训练和自信心。我们很高兴这些校友同意将他们的论文在本书中出版,献给我们的母校。

在编辑本书的过程中,我们首先请校友作者提供他们最好和最具代表性的论文。由于出版商的字数限制,我们从所收集到的 100 多篇论文中精选了 25 篇收入本书,尽可能广泛涵盖整个视觉科学领域。我们将内容互相连贯的各章节组织成两个部分:(I) 视觉神经科学;(II) 视觉知觉与认知。其中 IA 部分“皮层下的信息处理”中的六章包括光感受器细胞退化的恢复(第 1 章),视网膜-顶盖系统的变化(第 2 和第 3 章),视网膜神经节细胞的感受野特性(第 4 章)和外侧膝状体细胞的感受野特性(第 5 章),视觉皮层到外膝体的反馈(第 6 章)。IB 部分“皮层信息处理”中的九章包括视觉皮层细胞对图形和运动的处理(第 7, 8 和 9 章),空间特性和反应特性在视觉皮层的定位(第 10 章),以及注意(第 11 章)、知觉学习(第 12, 13 和 14 章)和老化(第 15 章)对视觉系统的影响。IC 部分“视动系统”中的三章包括视动神经元的反应特性(第 16 和 17 章),以及视动命令信号的可靠性(第 18 章)。第 II 部分中的七章讲述视知觉处理的基本过程,包括早期视觉通路的分辨率(第 19 章),距离感知(第 20 章),均亮颜色运动知觉(第 21 章),拓扑结构的感知(第 22 章),特征组合(第 23 章),计算机视觉(第 24 章),以及蜜蜂的视觉工作记忆和决策(第 25 章)。这些优秀的章节几乎覆盖了所有的视觉通路,可以作为高年级本科生和研究生学习视觉科学的很好的选读教材。

衷心感谢所有的作者和其他工作人员在编排本书的过程中给予我们的帮助和信心。其中,特别感谢李祥瑞协助将前言翻译成中文以及科大出版社的鼓励和合作。本书的编排工作也使我

们受益匪浅。一方面,它让我们从老师、同学和同事们那里学到很多知识;另一方面,又为我们结识了新的朋友,并加强了相互间的联系。在编排本书的过程中,我们意识到新一代的科大校友正在视觉科学领域里快速成长。可以预见,在不久的将来我们将有机会介绍他们的出色工作。

科大,50 岁生日快乐!

吕忠林,美国加州尔湾

周逸峰,中国安徽合肥

何生,美国明尼苏达州明尼阿波利斯

何子江,美国肯塔基州路易维尔

2008 年 2 月