

Preface

The eye is a complex sensory organ, which enables visual perception of the world. Thus the eye has several tissues that do different tasks. One of the most basic aspects of eye function is the sensitivity of cells to light and its transduction through the optic nerve to the brain. Different organisms use different ways to achieve these tasks. In this sense, the eye function becomes a very important evolutionary aspect as well and different animal models provide unique accessibility to eye experimentation.

It is largely accepted that vision originated in the early Cambrian about half a billion years ago. During the important evolutionary event that is known as the Cambrian explosion, it seems that an incredible number of phyla that gave rise to modern species had come into existence within a few million years. During that period compound eyes appeared in species, such as trilobites and arthropods. Other invertebrates possessed uncomplicated eye designs made up of simple visual organs mainly composed of photoreceptor cells protected by a pigment cell. Throughout evolution as well as in modern species, there are many different types of eyes. The grouping depends on the type of photoreceptors that the eye uses and of the eye architecture (compound or single-chambered). One

of the greatest debates in the eye field is how many times eyes have evolved independently during evolution and if there is a common ancestor. Based on the different types, it is obvious that eyes have evolved more than once. Also embryology teaches us that in different species eyes derive from different tissues. However, the identification of *pax-6* as the master gene in the development of different eye types testifies for a common ancestry. Given the number of different visual devices that animals have come up with it is obvious that depending on the eye type, we can acquire distinct knowledge from each one. This eventually will help to clarify the issues pertaining to eye evolution, development, and diseases. Thus, in this book we have assembled a series of chapters that address the uniqueness of different animal models in eye research. The reader will navigate through animal models spanning from bacteria to primates. Each animal has something unique to contribute to our understanding of how vision was evolved and how we can approach issues that affect it.

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