

## Darwin of the 20th century – Mayr or Dobzhansky?

Charles Darwin proposed the theory of natural selection to explain the mechanisms of evolution. His main idea was published as *On the Origin of Species*<sup>1</sup> in 1859 and is considered important even after ~150 years of its publication. Darwin's theory had a profound impact on the scientific and intellectual worlds and was acceptable to most biologists. The theory has two components: (i) descent with modification: all species – living and extinct – have descended from one or a few original forms of pre-existing species and (ii) natural selection as the causal agent of evolutionary change. It was also recognized that species not only evolve but also divide.

The most serious drawback of this theory stems from Darwin's lack of knowledge about genetics, as he could not explain nature and the causes of variations that are important for evolution. He did not define species but appears to have had a morphological species concept, which was central to his theory of natural selection<sup>2</sup>. According to Darwin, the term 'species' is arbitrarily used, for the sake of convenience, for a set of individuals closely resembling each other; it does not differ from the term 'variety' that is given to less distinct and more fluctuating forms. Probably, Darwin believed that the concept of species is unnecessary, as gradual evolutionary changes can account for the diversity of life.

Early naturalists and philosophers like Plato, Aristotle, Ray and Linnaeus have contributed significantly to taxonomy and systematics. The species is the basic category of biological classification and is defined as a group of similar organisms showing the same essence, which is based on the typological species concept (essentialism); but it was universally rejected. After the publication of Darwin's book, in the 2nd half of the 19th century, an entirely new concept – the biological species concept – was developed and elaborated in detail by Jordan<sup>3</sup>, Dobzhansky<sup>4</sup> and Mayr<sup>5</sup>. According to Mayr, 'Species is a group of actually or potentially interbreeding natural populations that is reproductively isolated from other such groups.' Dobzhansky says: 'Species is a reproductive community of

sexual and cross fertilizing individuals which share in a common gene pool.' These definitions stress on the dual biological significance of the species, reproductive isolating mechanisms and the Mendelian population as a protected gene pool.

Dobzhansky<sup>6</sup> coined the term 'isolating mechanisms' to denote factors which alone or in combination prevent gene flow between different Mendelian populations. His main contribution was in integrating genetics and evolution by providing laboratory evidence (viz. his work with *Drosophila*) for natural selection and variation. He advanced a comprehensive account of the evolutionary process in genetic terms in *Genetics and the Origin of Species*<sup>6</sup> published in 1937. This book had an enormous impact on naturalists and experimental biologists, who rapidly embraced the new understanding of the evolutionary process as one involving genetic changes in populations. It also gave rise to the modern synthetic theory as a generally accepted way of approaching problems of evolution. Although the term 'synthetic theory' was used by Huxley<sup>7</sup> for the first time, Dobzhansky is considered its foremost architect. The other architects of this theory are Mayr<sup>8</sup>, Simpson<sup>9</sup> and Stebbins<sup>10</sup>. The books written by these evolutionary biologists emphasized the genetic basis of evolution and helped in developing the concept of the modern synthetic theory of evolution.

Mayr was originally an ornithologist and has made contributions in the areas of ornithology, systematics and evolutionary biology. He established evolutionary biology as a separate field of research in the US, which earned him the name 'Darwin of the 20th century'<sup>11</sup>. He found a more constructive approach in the work of Dobzhansky – in his contribution to the evolutionary genetics of *Drosophila*. Drawing on the work of Dobzhansky, Mayr changed the paradigm permanently by using the biological species concept.

Marinkovic<sup>12</sup> explains that the synthesis occurred ~80 years after Darwin's book<sup>1</sup> with the appearance of Dobzhansky's book<sup>6</sup>. Accepting Darwin's theory as a basic theory of organic evolu-

tion, Dobzhansky emphasized the importance of population as a basic unit of evolution, the fitness of genotypes, differential reproduction rates and balancing selection in evolution.

The contributions of Mayr to the field of evolutionary biology are important. However in view of Darwin's theory of natural selection, considering the contributions of Dobzhansky – in providing the basis for the synthetic theory of evolution and in emphasizing the role of natural selection as a driving force of evolution acting on genetic variations in a population – Marinkovic's<sup>12</sup> suggestion is more appropriate – that is, naming Dobzhansky as the '20th century's Darwin'.

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