

Editorial

Amitabh Joshi, Guest Editor

The present issue of *Resonance* looks back on the life and work of Ernst Haeckel, one of the three most creative, influential and consequential biologists of the nineteenth century, along with Darwin and Mendel. Indeed, had Haeckel been a poet in Urdu rather than in German (which he was), he might have anticipated Iqbal by a few decades, and surpassed him in accurate prescience, by writing

*“khol kar aaNkheiN mere aaeenaa-e-guftaar meiN
aane waale daur kee dhundhalee see ik tasveer dekh”*

(Behold in the mirror of my words and rhymes / A shadowy picture of the coming times).

Haeckel’s professional life spanned the period between the publication of Darwin’s *On the Origin of Species* and the mayhem of what he was the first to term the World War, between 1914–18, and he was arguably the foremost popularizer of the Darwinian world-view, surpassing even Darwin in his reach and influence. He was also among the greatest invertebrate zoologists of all time, and the first to argue that humans and their societies were within the purview of an evolutionary explanation.

The Article-in-a-Box sketches out the chronological details of Haeckel’s life and work, placing both in the context of the intellectual climate and antecedents of the mid-to-late-nineteenth century Germany. The General Article on Haeckel’s work underscores his contributions to diverse fields in biology, ranging from human evolution, ecology and biogeography to the experimental and microscopic consideration of embryological development. In addition to being a great biologist, Haeckel was also a very skilled artist, and his biological illustrations are still appreciated for their artistic merit and technical detail. Consequently, in the Classics



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section, rather than reproduce an article of his, we have chosen to feature a selection by T N C Vidya of a few of his illustrative plates from the 1904 book *Kunstformen der Natur* (*Art Forms in Nature*). This book, legendary in the history of biological illustration, was first released between 1899–1904 in sets of ten plates each and, finally, as a book. The illustrations render Haeckel's view of the living world, its organizational levels and symmetries, in exquisite detail, and were transformed from sketches and watercolours to print by the lithographer Adolf Glitsch. I would particularly like to draw your attention to the two central images in the 'Discomedusae' plate (p.1287 in this issue). These are paintings of a strikingly beautiful species of jellyfish, *Desmonema annasethe* (now *Cyanea annasethe*), discovered, and named after his first wife Anna Sethe (see Article-in-a-Box), by Haeckel.

This issue also features the third article in an ongoing series on how to design experiments in animal behaviour, by Raghavendra Gadagkar. In this piece, Gadagkar writes about the manner in which the question of how ants find the shortest path to food was experimentally addressed by Jean-Louis Deneubourg and others. He also discusses how this work, born out of sheer child-like curiosity (Deneubourg was actually a theoretical chemist), later provided the foundations for the study of self-organization, also called distributed intelligence or bottom-up control. The work also became the inspiration and basis for the development of efficient computer algorithms for solving problems in discrete optimization, an issue of tremendous applied significance. Thus, as Gadagkar emphasizes, apparently 'useless' science, driven by nothing but curiosity, with no application in mind, can eventually lead to unexpected applications that turn out to be of great practical consequence.

We also have in this issue an article by T R Rao on trophic cascades, a large-scale phenomenon in ecology, a vastly important sub-field of biology which is also, coincidentally, a discipline delineated and named by Ernst Haeckel. Rao discusses examples of how the addition or removal of one or a few species in a trophic (food-based) network can have huge effects on the organization



and functioning of entire ecosystems, an issue of urgent concern in today's era of unprecedented anthropogenic change. In another article, Deepak Madival acquaints us with the life-cycle of cumulus clouds, emphasizing the microphysical processes underlying the birth, growth and death of the fluffy, cotton-like clouds that we are all familiar with. Moving deeper into physics, F M S Lima explains in detail the fascinating case of electric fields exactly on the surface of a charged conducting sphere. It turns out that, for points at the surface, the situation is far more recondite than textbook accounts would lead one to believe.

This issue also has two Classroom pieces on the condensation of water vapour under pressure, and on how the behaviour of the flame of a candle burning inside a glass tube open only at the top varies with the height of the tube, due to the constraint that the oxygen available for burning can enter the tube only from the top. The issue also has the usual 'Science Smiles' cartoon and, this time, also a Crossword. Happy reading!

