



EDITORIAL

Growth and Form – Volume 4

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The aim of *Growth and Form* is to publish papers on a wide range of models from applied mathematics for modeling biological phenomena and growth. Since its inception we have published several interesting papers, with very different perspectives. Volume 4 contains three articles, one review article and two research articles.

The review article by Edoardo de Tommasi and Alessandra Rogato discusses the link between shape and function to understand the evolutionary success of diatoms, unicellular microalgae which contribute massively to primary production and carbon sequestration on a global scale. The peculiar feature of diatoms is the frustule, a porous silica shell which encloses the protoplasm, which is characterized by the presence of regular patterns of micro- and nano-pores in an ultra-structured architecture. The diatom frustule seems to be involved in mechanical protection of the cell, sorting of nutrients from noxious agents, gas exchange and efficient coupling with solar radiation. The discussion on frustule morphogenesis and optical functions is linked to Gielis transformations as an elegant and efficient tool to describe its geometry.

The article by Matthew He deals with the genetic code on the one hand and a variety of mathematical phenomena on the other. The biological system divides the genetic four-letter alphabet of DNA and RNA into various three pairs of letters. The article investigates the geometric shapes and forms associated with these kinds of genetic code equivalences and shows that each equivalence has its own geometric shape and form. The geometric properties include attracting fixed point, repelling fixed point, basin of attractions, Julia sets and corresponding Mandelbrot sets, the golden ratio, ring ratio and unity ratio matrices associated with three kinds of genetic code equivalences.

Fred van Oystaeyen introduces a completely new generic model for space-time where time is just a totally ordered set, ordering the states of the universe at moments where over (not in) each state we define potentials or pre-things which are going to evolve via correspondences between the momentary potentials to existing things. It is shown how this model (the dynamic interval-moment model) allows to obtain elegant explanations for several counter-intuitive effects in quantum theory and hints at some drastic philosophical impact on interpreting events in this model of the universe. This model goes far beyond any space time models we know from physics and is perhaps closer to reality. It reminds us, as mathematicians, of Euler's dictum: "*Although to penetrate into the intimate mysteries of nature and thence to learn the true causes of phenomena is not allowed to us, nevertheless it can happen that a certain fictive hypothesis may suffice for explaining many phenomena.*" There are many possibilities and one suggested by Martin Gardner comes to mind: "*Perhaps an angel of God surveyed an endless sea of chaos, then troubled it gently with his finger. In this tiny and temporary swirl of equations, our cosmos took shape.*" Perhaps we will never know, but this new model is proof that science is ever evolving.

In 2024, we aim to expand the number of papers, based on our enlarged Editorial Board which was established in 2023. Sadly, two years after Peter L. Antonelli passed away, also Solange Rutz passed away earlier this year. Both were on our Editorial Board and representatives for applications of Finsler geometry, a geometry of natural shapes and phenomena. A final paper by Solange Rutz will be published next year.

Beyond publishing original papers, bringing together mathematicians and biologists is one of the main goals of this journal. In 2022, we initiated a symposium series entitled "International Symposium on Square Bamboos and the Geometree". In December 2023, its second edition took place. Written testimony of these symposia will be published in *Athena Transactions in Mathematical and Physical Sciences* which recently published the proceedings of the first edition. The symposia and the transactions should be considered as very close relatives of *Growth and Form*. With both we provide a growing platform to discuss new ideas and directions in geometry at the service of the natural and human sciences.

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