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Anschaulich: Visualization, Imagination, Mathematics

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The German word *anschaulich* roughly translates to *clear* in English, but it means much more than that. It has connotations of making things clear in a vivid fashion, to make abstract notions imaginable. In this issue our contributors explore connections between mathematics and the real world, making abstraction come alive.

We begin with Stephen Luecking's introduction to the interplay of art and mathematics in two and three dimensions. This includes an introduction to the concept and philosophy of *anschaulich*, and several schools of art that employed mathematics to create their work.

Part of this notion of *anschaulich* involves making the abstract real for students. Meredith Greer and Stephanie Kelley-Romano show how they accomplish this through an interdisciplinary activity that has students using mathematical modeling tools to understand and analyze crises during a presidential campaign.

D'Andre Adams, Daniela Beckelhymer, and Allison Marr delve into a the wonderful series of Choose Your Own Adventure books to reveal the graph theory at the heart of this unique literary form.

Melvin Currie shows how a Hidden Markov Model can be used with genetic data to learn about one's ancestry.

Getting students to reconsider gender stereotypes of mathematicians is the goal of Sarah Mayes-Tang's work, which uses stories of real women mathematicians to alter students' perspectives.

Is there a mathematical prize right for you? In his report Juan Matías Sepulcre takes us through the many societies and institutions trying to raise the profile of mathematics through prizes.

Victor Piercey and Geillan Aly show us how we can gain deeper clarity of thought through different visualizations and conceptualizations of elementary concepts in developmental mathematics, along the way finding beauty and joy in our teaching careers. Mindy Capaldi walks us through one mathematician's journey to understanding and appreciating the differences between statistics and mathematics.

We return to visualization with Stanisław Zawiślak and Jerzy Kopeć's graph-theoretical approach to the study of Anton Chekhov's famous *Uncle Vanya*. Helen Goodson then walks us through some milestones in her mathematics career. Marshall Gordon then returns us to the consideration of mathematics as an art, and how that might influence our teaching.

Mathematicians like to feel that our work allows us to connect to the real world. Jeana Mastrangeli tells us of three specific contexts where her mathematical training helped her: signal processing, art appreciation, and learning Italian. Issac Elishakoff continues this theme by connecting differential equations to great works of romantic literature.

Charles Coppin tells us a parable of teaching involving two mountain climbers with very different techniques for getting their protégés to the top. Matthew Oldridge considers how to share that first *anschaulich* moment with young children.

Günhan Caglayan introduces us to simulation through the FIFA World Cup, looking at the combinatorics and probability involved in the Group Stage games.

Through the years we have published several contributions that could be used as classroom resources or special activities with students in specific contexts. In this issue we begin assigning these to their own category: Activities. The first activity is described by Lingguo Bu, who in his article helps us visualize the ins and outs of a mathematical puzzle game, offering us ways to use this with students in open ended explorations.

In his perspectives essay, Nigel Vinckier considers what makes for the best foundations of mathematics. Is a geometrical view best? Analytical? What are the strengths and the issues with each approach?

We have two book reviews in this summer issue. Brendan Larvor brings us the first: a nuanced review of *What is a Mathematical Concept?*, an eclectic collection of essays edited by Elizabeth de Freitas, Nathalie Sinclair, and Alf Coles. Hans Rindisbacher then reviews the visually stimulating book *The Seduction of Curves* by Allan McRobie for an audience of humanistic mathematicians.

Several poets have contributed to this issue: Thomas Willemain, Rachel Levy, Christopher Ryan Loga, Ursula Whitcher, Bruce McGuffin, and Simona Carini all share their work with us.

Mario Daniel Martín describes an entrance exam for a would-be creator of a universe. Apparently some advanced knowledge is required. You can learn all about the requirements and the prerequisites in this comprehensive handout.

Aja Juola is the inaugural contributor to our new *Artwork* section, with a reimagining of the famed Niccolò Tartaglia. We are delighted to include Joula's work in this issue and look forward to publishing more artwork in the coming years.

In a recreation piece, Cache Dexter gives us an outline of how to bake a theorem in mathematics.

We close this summer issue with an announcement. According to Lawrence Lesser, one of the organizers, the third annual VOICES conference is coming up soon and will engage all those interested in teaching STEM using music and song. Be sure to check it out!