**Hypercomplex Analysis: Function Theory, Operator Theory, and Applications**
**L'analyse hypercomplexe : la théorie des fonctions, la théorie des opérateurs, et leurs applications**
(Org: **Pierre-Olivier Parisé** (Université du Québec à Trois-Rivières))

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**DANIEL ALPAY**, Chapman University

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**NATANIEL ALPAY**,

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**NATANIEL ALPAY**,

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**FABRIZIO COLOMBO**, Politecnico di Milano

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**MARCO ANTONIO PÉREZ DE LA ROSA**, Universidad de las Américas Puebla
*A Mathematical Framework for Two-Dimensional Diffraction Phenomena Based on Biquaternions*

This talk presents a mathematical framework for describing two-dimensional diffraction phenomena using biquaternions. In particular, biquaternionic counterparts of the two-dimensional Helmholtz–Kirchhoff integral theorem, the Fresnel–Kirchhoff diffraction formula, and the Rayleigh–Sommerfeld diffraction formula are derived. These results provide the foundation for a biquaternionic formulation of two-dimensional diffraction phenomena capable of treating scalar and vector fields within a unified framework. This approach offers an attractive alternative to traditional methods, particularly in settings where simultaneous analysis of scalar and vector components is required. As a special case, the classical one-dimensional Fresnel–Kirchhoff diffraction formula is recovered. This result serves as a consistency check and confirms the mathematical validity of the proposed framework. This is a joint work with Wanderson Maia Pimenta.

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**DAVID EELBODE**, University of Antwerp
*Multi-complex numbers and spinors*

Spinors are crucial and ubiquitous in both mathematics and physics, but they are less intuitive than rotations - despite the fact that spinors "merely" define an irreducible representation for the rotation (or spin) group. In this lecture we will try to explain where spinors really come from, and what they are trying to express geometrically. To do that, we will start from the Cartan-Dieudonné theorem (which factorises a rotation in terms of reflections) in the setting of geometric algebras (also known as Clifford algebras). Using simple multiplication rules in this algebra, which we will also derive from the geometry itself, we will then see how spinors spontaneously emerge as certain multivectors in this algebra. We will then proceed with noting that there are pure spinors, which have a nice and geometric interpretation, but in dimensions $m \geq 8$ one gets impure spinors as well. These are very interesting, leading to for instance models in the geometric algebra for exotic number systems such as the octonions and sedenions, but less intuitive. We will explain the connection with multi-complex numbers, and if time permits also show how these exotic structures are embedded.

**JOSÉ OSCAR GONZÁLEZ-CERVANTES**, Instituto Politécnico Nacional, ESFM

**PIERRE-OLIVIER PARISÉ**, Université du Québec à Trois-Rivières
*Hypercomplex fractals obtained by conjugations*

In 2000, D. Rochon used the bicomplex numbers to define a four-dimensional generalization of the classical Mandelbrot set. These numbers were later used to generalize the Multibrot sets to higher dimensions.

In this talk, by adding a conjugate to the iteration that generates the bicomplex Mandelbrot set, I will present a four-dimensional generalization of the Multicorn sets introduced by Dierk Schleicher. I will also establish a rigorous lower bound on the distance from a point to the bicomplex Multicorns, and use it in a ray-marching algorithm to visualize their three-dimensional cross-sections.

This is joint work with Dominic Rochon.

**IRENE MARIA SABADINI**,