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LAYMAN'S ABSTRACTS

Benthic Macroinvertebrate Community as an Indicator of Stream Health: The Effects of Land Use on Stream Benthic Macroinvertebrates

Danielle Dominique D. Deborde, Maria Brenda M. Hernandez and Francis S. Magbanua

Biological monitoring of stream health in the tropical countries still uses standard water chemistry methods, which require expensive measuring tools. In this study, the use of benthic macroinvertebrates as biological indicators of freshwater streams was carried out. The study also attempted to determine the applicability of different biotic indices (numerical scores for stream health evaluation) in characterizing sites across land use type. Benthic macroinvertebrate samples were obtained from nine streams in Silago, Southern Leyte and were identified up to family level. Average Tolerance Score per Taxon (ATSPT) was the only biotic index to successfully differentiate the water quality of nine streams based on land use, which ranged from moderately poor to excellent. Forested sites achieved the lowest ATSPT score, whereas mixed forested-agricultural sites had the highest ATSPT scores. The results establish that benthic macroinvertebrates can be used as biomonitoring tool in evaluating the ecological integrity of waterways in the country.

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The Real Orthogonal Group and Vahlen Matrices

Bimal Kunwor, Dennis I. Merino, Edgar N. Reyes and Gary A. Walls

Let an integer $n \geq 2$ be given. Let $\hat{\mathrm{R}}^n = \mathrm{R}^n \cup \{\infty\}$ be the extended Euclidean space. A Möbius transformation is a function from $\hat{\mathrm{R}}^n$ onto $\hat{\mathrm{R}}^n$ that transforms spheres and hyperplanes to either spheres or hyperplanes. Of particular interest are the Möbius transformations that map the unit sphere S^{n-1} onto a hyperplane that is orthogonal to a given unit vector. The restriction of such a Möbius transformation to S^{n-1} is called a stereographic projection. Let $\prod : \mathrm{S}^{n-1} \to \hat{\mathrm{R}}^{n-1}$ be a stereographic projection. It is known (due to Lars Ahlfors) that any Möbius transformation may be expressed as a pseudo linear fractional transformation defined by a 2-by-2 Vahlen matrix with entries in a Clifford algebra. Conjugating by $\prod$, we embed the real orthogonal group $O(n)$ into a projective group of Vahlen matrices. We also provide results on eigenvalues of 2-by-2 matrices with entries in a Clifford algebra.

Detailed Calculation of the Average Work Done in a Ground State Quench of the Quantum Ising Model

Salvador T. Laurente Jr. and Francis N.C. Paraan

Work is done on the Ising model of a quantum magnet when an external magnetic field is changed instantaneously. Vertical tangents and inflection points appear in graphs of the work done versus the initial field. These singular features arise from an underlying zero-temperature phase transition between a ferromagnetic ordered phase and a paramagnetic disordered phase.

On the Solvability of a Quasilinear Parabolic Problem with Neumann Boundary Condition

Mylen L. Aala, Editha C. Jose and Marian P. Roque

Parabolic partial differential equations (PDEs) are widely known for modeling physical phenomena. They have many applications, especially in the areas of science and engineering. In this paper, we study a parabolic PDE which models heat transfer in a perforated cell. In our system, the thermal conductivity represented by a matrix is dependent on the temperature field and the temperature itself. We impose a certain condition for the heat flux on the boundary, as well as some initial condition. We show the existence of a solution to our problem in an appropriate functional space. We also prove that the solution we obtained is unique.

Potential Cholesterol-lowering Activity of Selected Plant Extracts

Raffi R. Isah and Christine L. Chichioco-Hernandez

β-Hydroxy-β-methylglutaryl-Coenzyme A reductase (HMG-CoA reductase) catalyzes the NADPH-dependent reduction of HMG-CoA to mevalonate. This reaction is the rate-limiting step in cholesterol synthesis. Inhibition of HMG-CoA reductase helps in the reduction of the high levels of plasma cholesterol, which is a primary risk factor in coronary artery diseases, such as atherosclerosis. This study examined the HMG-CoA reductase inhibitory activities of five Philippine plants, namely *Pouteria campechiana* (Kunth) Baehni, *Barringtonia asiatica* (L.), *Vitex parviflora* A. Juss., *Antidesma bunius* (L.) Spreng., and *Diospyros blancoi* A.DC. The HMG-CoA reductase inhibitory activities of the plants were determined spectrophotometrically at 340 nm, utilizing the oxidation of NADPH and with HMG-CoA as the substrate. *Pouteria campechiana*, *A. bunius*, and *D. blancoi* exhibited percent inhibition values of more than 70% among the five methanol extracts. The last two plants were further partitioned, and their respective hexane, ethyl acetate, and aqueous extracts displayed more than 80% inhibition.

Keywords: β-Hydroxy-β-methylglutaryl-Coenzyme A reductase, medicinal plants, plant extracts