



UNIVERSITY OF L'AQUILA

SEMINARS

Wednesday 25 November 2015, 3:00 pm

University of L'Aquila, Department of Civil, Construction-Architectural and Environmental Engineering, Via Giovanni Gronchi 18 - Zona industriale di Pile, 67100 L'Aquila

3:00 pm

Art, Craft and Philosophy of Science

Professor K. R. Rajagopal

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Abstract

Before one can develop an adequate theory to describe natural phenomena, it is imperative to understand the underpinnings of natural philosophy in particular and philosophy in general, have an appreciation for the history of natural philosophy, have great facility with the natural language for its expression; in the case of natural philosophy this being mathematics. But this alone is insufficient; one needs to understand the interplay between science, language, psychology, philosophy, politics, economics, and societal demands amongst many other subjects, as they all have an impact on the path science takes. One is interested in the development of a theory of sufficient generality; it ought not to merely explain a specific phenomenon, it should have predictive capability, be simple, be endowed with an economy of expression, lead to a consilience of induction, be capable of falsifiability, to name some of them. In this talk, I will discuss some of the features that go into the development of a scientific theory. Art, craft and philosophy all play a crucial role in the development of scientific theories.

4:00 pm

Some linear and non-linear elasticity lattice problems revisited in the light of nonlocal mechanics

Professor N. Challamel

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Abstract

This seminar is devoted to the foundation of some enriched continua such as nonlocal or gradient-type structural mechanics, from discrete or lattice elasticity arguments. It is shown that discrete strings (or lattice string) as already considered by Lagrange during the *XVIIIth* century may be revisited in the light of modern mechanics theories such as nonlocal mechanics. During the *XIXth* century, Piola built some nonlocal-type or gradient-type media from discrete microscale interactions. Hencky-bar system, developed at the beginning of the *XXth* century can be considered as the paradigmatic bending lattice with inherent length scale. The nonlocal or gradient-type laws which emerge from a continualization procedure of such structural lattice are used for analysing some in-plane and out-of-plane beam instabilities problems and are then generalized to two-dimensional plate media. Geometrical and material non-linearities may be also accounted for at the lattice scale, thus generating some nonlocal or higher-order gradient laws at the macroscopic scale.

Nonlocal structural mechanics is definitely an efficient engineering theory that may be able to capture the fundamental scale effects related to the microstructure at the finer scale. A lot of applications may be found in the small-scale world (especially for micromechanics or nanomechanics applications since the beginning of the *XXIth* century) but also for large scale civil engineering structures such as truss structures for instance. Discrete mechanics is not only a way to take into account rigorously the microstructure phenomena: it contributes to a better understanding of the behaviour of matter, following Bergson thoughts on the capability of our mind to better represent the reality by discontinuous objects.

« L'intelligence ne se représente clairement que le discontinu. »
Henri Bergson