

Boletín del IMI, Nº 79 (23 de febrero de 2023) <https://doi.org/10.57037/b-imi.00079>

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## 1) Eventos del 23 de febrero al 3 de marzo de 2023

### Seminario de Análisis Matemático y Matemática Aplicada

**Title:** An introduction to the big and little lip functions

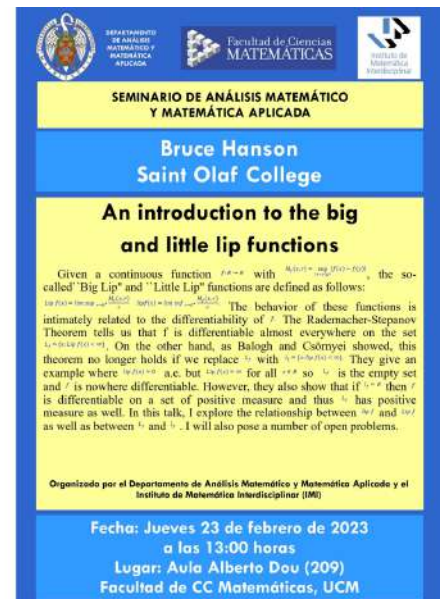
**Speaker:** Bruce Hanson (St. Olaf College)

**Day:** 23rd February, 2023

**Hour:** 13:00h

**Place:** Seminario Alberto Dou (Room 209), Facultad de CC. Matemáticas, UCM

**Organized by:** Instituto de Matemática Interdisciplinar (IMI) y el Departamento de Análisis Matemático y Matemática Aplicada



SEMINARIO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA

Facultad de Ciencias MATEMÁTICAS

INSTITUTO DE MATEMÁTICA INTERDISCIPLINAR

**SEMINARIO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA**

**Bruce Hanson**  
Saint Olaf College

**An introduction to the big and little lip functions**

Given a continuous function  $f: \mathbb{R} \rightarrow \mathbb{R}$  with  $f(0) = 0$ , the so-called "Big Lip" and "Little Lip" functions are defined as follows:  
 $L_f(x) = \sup_{0 < t < x} \frac{f(t) - f(0)}{t}$  and  $l_f(x) = \inf_{0 < t < x} \frac{f(t) - f(0)}{t}$ . The behavior of these functions is intimately related to the differentiability of  $f$ . The Rademacher-Stepanov Theorem tells us that  $f$  is differentiable almost everywhere on the set  $\{x \in \mathbb{R} : l_f(x) < \infty < L_f(x)\}$ . On the other hand, as Balogh and Csörnyei showed, this theorem no longer holds if we replace  $\mathbb{R}$  with  $\mathbb{R}^n$  for  $n \geq 2$ . They give an example where  $l_f(x) = 0$  a.e. but  $L_f(x) = \infty$  for all  $x \neq 0$ , so  $\{x \in \mathbb{R}^n : l_f(x) < \infty < L_f(x)\}$  is the empty set and  $f$  is nowhere differentiable. However, they also show that if  $f: \mathbb{R}^n \rightarrow \mathbb{R}$  then  $f$  is differentiable on a set of positive measure and thus  $l_f$  has positive measure as well. In this talk, I explore the relationship between  $l_f$  and  $L_f$  as well as between  $l_f$  and  $L_f$ . I will also pose a number of open problems.

Organizado por el Departamento de Análisis Matemático y Matemática Aplicada y el Instituto de Matemática Interdisciplinar (IMI)

**Fecha:** Jueves 23 de febrero de 2023  
a las 13:00 horas  
**Lugar:** Aula Alberto Dou (209)  
Facultad de CC Matemáticas, UCM

## Seminario de Análisis Matemático y Matemática Aplicada

**Title:** Equivalence results for limiting interpolation spaces and its applications

**Speaker:** Manvi Grover (Charles University, Prague)

**Day:** 2nd of March, 2023

**Hour:** 13:00h

**Place:** Seminario Alberto Dou (Aula 209), Facultad de CC Matemáticas, UCM

**Organized by:** Instituto de Matemática Interdisciplinar (IMI) y el Departamento de Análisis Matemático y Matemática Aplicada

The poster is a vertical rectangular graphic with a blue border. At the top, it features three logos: the UCM logo, the Department of Mathematical Analysis and Applied Mathematics logo, and the Faculty of Sciences Mathematics logo. Below the logos, the text reads 'SEMINARIO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA'. The speaker's name 'Manvi Grover' and affiliation 'Charles University-Prague' are listed in a blue box. The title 'Equivalence results for limiting interpolation spaces and its applications' is in a yellow box. The abstract text is in a white box, and the date and location are in a blue box at the bottom.

SEMINARIO DE ANÁLISIS MATEMÁTICO  
Y MATEMÁTICA APLICADA

Manvi Grover  
Charles University-Prague

**Equivalence results for limiting interpolation spaces and its applications**

We establish conditions under which  $K$ -spaces in the limiting real interpolation involving slowly varying functions can be described by means of  $J$ -spaces and we also solve the reverse problem. Further, we apply our results to obtain density theorems and dual spaces for the corresponding limiting interpolation spaces.

Organizado por el Departamento de Análisis Matemático y Matemática Aplicada y el Instituto de Matemática Interdisciplinar (IMI)

Fecha: Jueves 2 de marzo de 2023  
a las 13:00 horas  
Lugar: Aula Alberto Dou (209)  
Facultad de CC Matemáticas, UCM

## 2) Nuevas publicaciones

P. Bangere, **F. J. Gallego**, M. González. Deformations of Hyperelliptic and Generalized Hyperelliptic Polarized Varieties. *Mediterranean Journal of Mathematics*. 2023, 20(2).

<https://doi.org/10.1007/s00009-023-02278-5>

J. A. Carrillo, **D. Gómez-Castro**, Y. Yao, C. Zeng. Asymptotic Simplification of Aggregation-Diffusion Equations Towards the Heat kernel. *Archive for Rational Mechanics and Analysis*. 2023, 247(1). <https://doi.org/10.1007/s00205-022-01838-5>

### 3) La viñeta matemática

Viñeta enviada por los hermanos Ángel y José Luis González Fernández, creadores de "Troncho y Poncho".



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