

Universidad de Panama, Panama City

## **Pierre Legendre**

Département de sciences biologiques, Université de Montréal  
C.P. 6128, succursale Centre-ville  
Montréal, Québec H3C 3J7, Canada

E-mail: [Pierre.Legendre@umontreal.ca](mailto:Pierre.Legendre@umontreal.ca)

Web site (distribution of R functions and PDFs of research papers):  
<http://numeralecology.com>

*Short course on*

## **Recent Advances in Spatial Analysis of Multivariate Ecological Data: Theory and Practice**

February 22–26, 2016

### **Day 1**

0. Introduction to data analysis.
1. Ordination in reduced space: principal component analysis (PCA), correspondence analysis (CA), principal coordinate analysis (PCoA).
2. Transformation of species abundance data tables prior to linear analyses.

### **Day 2**

3. Measures of similarity and distance, especially for community composition data.
4. Multiple linear regression. R-square, adjusted R-square, AIC, tests of significance.
5. Polynomial regression.
6. Partial regression and variation partitioning.

### **Day 3**

7. Statistical testing by permutation.
8. Canonical redundancy analysis (RDA) and canonical correspondence analysis (CCA).  
Multivariate analysis of variance by canonical analysis.
9. Forward selection of environmental variables in RDA.

**Day 4**

10. Origin of spatial structures.
11. Beta diversity partitioning and LCBD indices
12. Replacement and richness difference components of beta diversity

**Day 5**

13. Spatial modelling: Multi-scale modelling of the spatial structure of ecological communities: dbMEM, generalized MEM, and AEM methods.
14. Community surveys through space and time: testing the space-time interaction in repeated surveys.
15. Is the Mantel test useful for spatial analysis in ecology and genetics? (If time allows)

-----

**⇒ Lectures in the morning.**

**⇒ Afternoons: Practicals about these topics using the R language**

The following files are distributed in the folder Practicals\_in\_R.zip –

- Day-by-day list of the practical exercises (file: Short\_course\_practicals.pdf)
- Introduction to the R statistical language (file: Introduction\_to\_R.pdf)
- Practicals in the R language: Basic matrix operations (file: Basic\_matrix\_operations.pdf)
- Practicals using the R statistical language (file: Practicals\_in\_R.pdf)
- Documentation file for PCNM function (file: PCNM\_documentation.pdf)
- Documentation file for pcoa.all function (file: pcoa.all\_documentation.pdf)

The following files are distributed in the folder Spatial\_eigenfunction\_practicals.zip –

- NEwR Script Chapter 7
- Gault\_forest\_reserve
- Legendre-Gauthier practicals