

School of Environmental Systems Engineering  
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WWW page for free software: <http://www.bio.umontreal.ca/legendre/>

WWW page for this course : <http://biol09.biol.umontreal.ca/Perth09/>

### *Master Class on*

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

### **Day 1**

0. Introduction to data analysis.
1. Ordination in reduced space: principal component analysis (PCA), principal coordinate analysis (PCoA), correspondence analysis (CA).
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 regression. R-square and adjusted R-square. Partial regression.

### **Day 3**

5. Statistical testing by permutation.
6. Canonical redundancy analysis (RDA) and canonical correspondence analysis (CCA).  
Multivariate analysis of variance by canonical analysis.

### **Day 4**

7. Forward selection of environmental variables in RDA.
8. Spatial modelling: Origin of spatial structures. Multi-scale modelling of the spatial structure of ecological communities (PCNM). Extensions: MEM, AEM. Test of space-time interaction in repeated surveys.

**Day 5, morning**

9. Spatial structure functions: correlograms, variograms. Control for spatial autocorrelation in tests of species-environment relationships.
10. Cartographic interpolation, kriging.
11. Spatial variation partitioning: canonical analysis or Mantel test?

**Day 5, afternoon**

- Discussion of study cases presented by participants.

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**⇒ Afternoons, days 1–4: Practicals about these topics using the R language**

- 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)