#### WORKSHOP ON HISTORICAL BIOGEOGRAPHY

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#### I. INTRODUCTION

In a 1959 essay entitled "The Voice of Poetry in the Conversation of Mankind", Michael Oakeshott develops the notion of knowledge as a communityowned social construct that is the result of our ability to participate in an unending conversation. Oakeshott says: "As civilized human beings, we are the inheritors, neither of an inquiry about ourselves and the world, nor of an accumulating body of information, but of a conversation, begun in the primeval forests and made more articulate in the course of centuries. It is a conversation which goes on both in public and within each of ourselves."

According to Oakeshott, education, properly speaking, is an initiation into the skill and partnership of this conversation in which we learn to recognize the voices, to distinguish the proper occasions of utterance, and in which we acquire the intellectual and moral habits appropriate to conversation. And it is this conversation which, in the end, gives place and character to every human activity and utterance.

Each voice is the reflection of a human activity, begun without premonition of where it would lead, but acquiring for itself in the course of the engagement a specific character and a manner of speaking of its own: and within each mode of utterance modulation is discernible.

Among the voices of biology, historical biogeography recently has acquired, or begun to acquire, an authentic voice and language of its own. The purpose of this workshop is to consider the voice of historical biogeography, its different tones of utterance, manners of speaking, modulation, and manner of thinking and we will listen to this voice mainly as it sounds when it tells histories of South America.

To listen to the voice of historical biogeography using empirical examples of South America, is a return to the birth of the evolutionary theory, as Darwin himself stated in the opening paragraph of "The Origin of the Species" (1859): "When on board H.M.S. 'Beagle', as naturalist, I was much struck with certain facts in the distribution of the inhabitants of South America, and in the geological relations of the present to the past inhabitants of that continent. These facts seemed to me to throw some light on the origin of species..."

Today, as in Darwin's time, the distribution of the living beings is an inexhaustible source of light on the evolution of life on earth. Actually, there are few facets of evolutionary biology that cannot be illuminated by the study of the history of these distributions, the so-called historical biogeography. Furthermore, historical biogeography is passing through an extraordinary revolution that includes its

fundamental principles, basic concepts, methods and relationships with other disciplines of comparative biology. For these reasons, we believe that a workshop on the theory and practice of historical biogeography is useful. It is not our goal to suggest the adoption of a single method as a universal panacea but the understanding of the biological assumptions of each method.

We will explain and illustrate the fundamentals and the most frequently used methods of historical biogeography so that they can be understood and practiced by the participants.

This workshop will ground the participants in the fundamentals and methods of historical biogeography and guide her/him in all phases of their understanding and use.

The participant will learn:

- 1. The fundamentals of the discipline;
- 2. how to recognize when one has a research problem that requires a historical biogeographic approach;
- 3. how to decide upon the most appropriate kind of data to collect;
- 4. how to choose the best method for the problem at hand;
- 5. how to perform the necessary calculations, and if a computer program is needed, which one to use; and
- 6. how to interpret the results.

Another special feature of this workshop is the inclusion of empirical applications, selected mainly from our own research program on historical biogeography. They encompass a variety of research goals and contexts and give an overall picture of how these methodologies are used. Furthermore, these cases will facilitate the understanding of the how-to information.

# II. GENERAL OBJECTIVES

The general workshop objectives are to:

- teach the participants how to apply historical biogeographic methodologies;
- teach the participants the use of computer-assisted algorithms; and
- discuss the criteria used to select among the different methodological options that historical biogeography currently offer us.

## III. LEARNING OBJECTIVES

At the end of the workshop the participants should be able to:

- understand the principles, impact, and history of historical biogeography and its contribution to comparative biology;
- critically interpret and evaluate its methodologies;
- ask biogeographic questions, manipulate variables and collect data;
- apply these methods to different biogeographical problems;

- use computer-assisted algorithms to apply these methods;
- value critical thinking, creative and rational discussions, the role of quantitative reasoning and computers; and
- design a biogeographic project, and then implement, adapt and assess it.

#### IV. WORKSHOP SYLLABUS

- Unit 1. Historical biogeography: Definition, concepts, and its present circumstances. Spatial Analysis. Taxonomy of methods.
- Unit 2. Distribution areas. Areas of endemism. Definition. Delimitation. Size.
- Unit 3. Center of origin and dispersal. The concept of center of origin.
- Unit 4. Phylogenetic biogeography. Basic rules. Ancestral areas. Camin-Sokal optimization.
- Unit 5. Panbiogeography. Track analysis. Track compatibility.
- Unit 6. Cladistic biogeography. Constructing the area cladograms. Obtaining the general area cladogram/s. Component analysis. Brooks parsimony analysis (BPA). Paralogy-free subtrees. Integrative method.
- Unit 7. Parsimony analysis of endemicity. PAE based on localities. PAE based on areas of endemism. PAE based on quadrats.
- Unit 8. Event based methods. Reconciled trees or Maximum Cospeciation (MC). Dispersal-vicariance analysis (DIVA).
- Unit 9. Phylogeography. Phylogeographic hypotheses and corollaries.
- Unit 10. Framing of historical biogeographic hypotheses.
- Unit 11. Molecules in space-time. Molecular phylogenies and biogeography. Relevance of time: The molecular clock.
- Unit 12. The future: A conceptual framework.

#### V. TIMETABLE

Thursday November 21, 2002 Morning Units 1, 2, 3, and 4 Afternoon Units 5 and 6 Computer applications Friday November 22, 2002 Morning Units 7, 8, and 9 Afternoon Units 10, 11, and 12 Computer applications Saturday November 23, 2002 Morning - Afternoon Computer applications

# VI. TEACHING STRATEGIES

The teaching format includes the following guiding principles:

- establish a learning community in the classroom (e.g., group cooperative learning);
- make connection to participants' world and orientations;
- actively engage participants in biogeographic methodologies;
- make instructional decisions in terms of participant learning;
- use a variety of resources and examples;
- promote creative, rational, critical thinking in the participants.

# VII. FORMAT OF THE WORKSHOP

This workshop will consist of four components:

- a lecture series to present and discuss the methods as well as examples of their use in various taxonomic groups and areas;
- discussion sessions to introduce manual methods and the use of computer-assisted algorithms;
- manipulation of variables and collection of data sessions during which participants will work on hypothetical data;
- data analysis sessions during which participants will analyze one or more data sets.

## VIII. DURATION

19 hours in a 3 days period.

## IX. DIDACTIC TOOLS

- personal computers (Apple Macintosh);
- software:

- MacClade (Maddison & Maddison, 2001).
- PAUP (Swofford, 2000).
- DIVA (Ronquist, 1996).
- slide projector
- literature
- blackboard
- transparency projector

# X. LITERATURE

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