

# Research Statement

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## Research Interest Keywords

Applications to biology and medicine.  
Biostatistics, statistical genetics, phylogenetics, clinical trials.  
Hierarchical Bayesian methods, computational statistics.  
Quality, experimental design, and process optimization.

## 1 Research Statement

My research interest is in the application and development of statistical methods for biological and medical questions. I enjoy interdisciplinary collaborations for the opportunity to contribute and learn in a cooperative environment. In particular I'm excited by situations where scientists are using methods that can greatly benefit from statistical development, and then working with them to improve those methods. I have repeatedly applied my statistical, mathematical, and computational knowledge, skills, and experience to modeling and writing the software for estimation, prediction, and simulation. As a graduate student I have taken opportunities to work in areas of simultaneous inference, public health research, phylogenetics, and, most recently, underconstrained systems arising in ecological applications. My successes in all of these areas give me confidence that I am capable of excellence in many settings.

## 2 Current Research

### 2.1 Underconstrained Systems

In Ecology, and other applications, the proportions of sources consumed in the diet of a consumer is of interest. Mass-balance models provide a mechanistic, and hence predictive, foundation for animal isotopic ecology (Martínez del Rio and Wolf, 2005). However, often many sources are considered, while only a few elemental isotopes to constrain the system, leading to an underconstrained solution space for dietary proportions. SISUS: Stable Isotope Sourcing Using Sampling (available at [StatAcumen.com/sisus](http://StatAcumen.com/sisus)) is a Bayesian statistical model and software aiming to provide a comprehensive solution to stable isotope sourcing inference and prediction problems.

### 2.2 Phylogenetics

Under the coalecent process of evolution, we wish to reveal whether collecting data on more taxa or more genes leads to more consistent estimation of phylogenies. Joint work with Laura Salter Kubatko.

### 2.3 Public Health Epidemiology

I am the statistician for the largest individual case-control study of Hodgkin's disease in children centered at the UNM Cancer Research and Treatment Center, with three to five publications anticipated for 2008.

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**2.13**

Zoe Gardner

\* Manuscript revision

SINT (Nandram)

\* Revision

Jeff Nekola

\* statistical tests for distance decay relationships

Helen Davis

\* Parasites

Jordan Okie

\* Body size distributions

Tsimani

\* Social Network Analysis

Ani Humberson

\* Manuscript submitted 8/31/07

### **3    Research Plans**