Preface

This monograph has resulted from a CBMS short course given by Gelfand at the University of California at Santa Cruz the week of August 14-18, 2017. A total of 10 lectures spanning 20 hours were presented. The title of the course was "Bayesian Modeling for Spatial and Spatio-temporal Data." This monograph extracts a portion of the lecture material which focuses on spatial point patterns and substantially expands it, in addition to providing introductory material (Chapter 1).

The decision to focus on spatial point pattern models reflects the fact that this area of spatial analysis has, arguably, received the least attention in the literature and, even less within the Bayesian community. At this point, the other, more mainstream spatial and spatio-temporal material is discussed and readily available in many books. The monograph provides a forum for presentation of novel Bayesian inference and model fitting material which has been very recently developed by Gelfand and collaborators. This material is predicated on an assumption which currently drives much Bayesian work: if you can fit a Bayesian model and if you can simulate realizations of the model, you can do full Bayesian inference under the model.

After a chapter on the basic theory of point patterns (Chapter 2), Chapters 3, 4, and 5 present the full story for inference, simulation, computation, with several interesting applications. As a monograph, limited in length, accordingly the development is limited. We only discuss a small portion of the theory and we only consider a subset of available spatial point pattern models. Also, we do not find space for development of space-time point pattern work. However, we have provided extensive referencing to enable the reader to track down further material of interest. The material is intended to be quite accessible, at say a Masters level in Statistics. Furthermore, we hope the reader will find the recently developed material presented here to be stimulating; hopefully it will encourage further work along the Bayesian path we have laid out.

While much of the content is derived from work of Gelfand, it is important to note that Schliep prepared much of Chapter 4 and a portion of Chapter 5. In addition, she provided the examples, with associated fitting, computation, and displays. Also, she ensured that the manuscript came together coherently and attractively. The authors thank Athanasios Kottas, Rajarshi Guhaniyogi, and Bruno Sansó for taking the initiative to organize this course/workshop as well as to facilitate its smooth presentation. Also acknowledged is the National Science Foundation for support of this workshop. Lastly, the authors thank those working with the Conference Board of the Mathematical Sciences (CBMS) in helping to produce the monograph, David Bressoud and Elyse Gustafson.

Alan E. Gelfand
Department of Statistical Science, Duke University
Durham, North Carolina

Erin M. Schliep
Department of Statistics, University of Missouri
Columbia, Missouri