

SFI WORKSHOP & WORKING GROUP PROPOSAL

Please complete this form and return to sfiscience@santafe.edu for consideration by the Chair of Faculty (Working Groups) or by the Science Steering Committee (Workshops).

Working Groups are more informal, typically have <12 participants, and generally meet in the Collins Conference Room and/or at SFI Tesuque. Working Group proposals should be submitted at least 1-2 months prior to meeting dates.

Workshops have more formal agendas, typically have 20-40 participants, and meet in the Noyce Conference room. Workshop ideas should be discussed with the Chair of Faculty (COF) and proposals should be submitted at least 6-8 months in advance of desired meeting dates to allow time for SSC evaluation and potential revision and re-evaluation by the SSC.

You can consult with the Events Manager, Bruce Bertram (bertram@santafe.edu) about potential meeting dates and room availability prior to submitting your proposal.

- A. **Title of Meeting:** Coupled grassland and mammalian community dynamics over ecological and evolutionary timescales
- B. **Type of Meeting** (Working Group or Workshop): Working Group
- C. **Organizer(s) & Affiliations:** Justin D. Yeakel (SFI); Nathaniel Dominy (Dartmouth)
- D. **Dates of Event** (actual meeting days): September 30 - October 2
- E. **Meeting Room Preference:** Collins or Noyce Conference Room
- F. **Budget:** Attach a completed budget spreadsheet. Contact the COF with questions.
- G. **Summary of Budget & Funding Sources:**
 - Total budget amount: \$17426
 - Amount requested from SFI science: \$15000
 - Amount/identity of other funding sources: Dartmouth: \$1400; JD Yeakel Discretionary Fund: \$1026
 - Amount to be raised: \$0
- H. **Description:** Include a short summary paragraph about the meeting for the SFI website. Then, give a more detailed description of the proposed meeting (typically 1-4 pages).

Short 1-Paragraph Meeting Summary

The emergence and expansion of grassland habitats in the late Cenozoic has had a profound influence on mammalian evolution and community structure. The extent to which these habitat dynamics influenced mammalian evolution, or contributed to the structure of both past and contemporary mammalian communities is unknown. The present Working Group proposal aims to integrate paleontological and contemporary understandings of mammalian and grassland evolution and ecology, incorporating food web and community dynamics, foraging ecology, and the ecology and evolution of social groups - factors that operate on both ecological and evolutionary timescales. The Working Group is conceived to address questions in two stages. Stage 1 at SFI will facilitate cross-disciplinary introductions and interactions, the sharing of unpublished data and identification of data voids, and the assignment of collaborative tasks. Stage 2 at Dartmouth College is conceived to induce completion of analyses and as a forum for sharing and integrating the outcomes of our work. Ultimately, our goal is to bundle the papers in a journal that specializes on themed issues, such as *Interface Focus*, *Journal of Ecology*, or *Philosophical Transactions of the Royal Society B*.

1-4 Page Description of Meeting

Include a description of the meeting topic, the rationale for holding the meeting at SFI, potential outcomes, and participants. Please indicate which participants have been contacted, and which are initially confirmed. Consult with the Chair of Faculty if you have any questions and to get feedback on Workshop proposals, which should be more detailed than Working Group proposals.

Coupled grassland and mammalian community dynamics over ecological and evolutionary timescales

Background The evolution of grassland habitats in the late Cenozoic has had a profound influence on mammalian evolution and community structure. Although the origins of C_3 grasses are placed firmly in the Mesozoic, it was not until the early-mid Miocene that many forested habitats gave way to either heterogeneous grassland-woodland mosaics, or grass-dominated savannas. A second phase in grassland evolution occurred with the rise and spread of C_4 grasses (which differ from C_3 grasses in that they concentrate CO_2 within their tissues), which tend to be drought-tolerant with fast turn-over and slow decomposition rates, promoting fire to the exclusion of woody vegetation. These evolutionary events directly followed the height of mammalian diversification, and are thought to have since played an important role in the evolutionary and ecological constraints driving many mammalian communities.

Grassland expansion in a previously forested environment changes the fitness landscape over which the success or failure to survive and reproduce is determined. Open or patchy grassland-woodland environments introduce a relatively homogeneous yet low quality nutritional resource that reduces the uncertainty of acquisition (e.g. as compared to the temporally and spatially heterogeneous masting events in forests), yet places severe demands on consumption and digestion. Moreover, grasslands are open environments, easing the difficulties of travel, yet reducing cover, altering predation risks. These combined features of grasslands have often been cited as a primary driver of mammalian body size evolution, stimulating the formation of large social groups, and playing a central role in human evolution. It is also known that the evolution of grassland-adapted mammals has had a reciprocal impact on the establishment and maintenance of grasslands themselves. To what extent these habitat dynamics influenced mammalian evolution, or contribute to the structure of both past and contemporary mammalian communities is unknown.

Aims This Working Group aims to investigate the consequences of grassland habitats on mammalian ecology and evolution in both species-specific and community contexts. Among the questions this Working Group aims to address include (but are not limited to):

- *How do savanna-woodland habitats impact the structure of communities?*
- *What is the interplay between spatial heterogeneity and consumer behaviors in grassland-woodland environments?*
- *How did the emergence of grassland ecosystems influence the evolutionary dynamics of different mammalian guilds?*
- *What ecological challenges did grasslands introduce to forest-adapted mammalian species, and how did this influence human evolution?*

To address these questions, we will bring together diverse scholars. For instance, researchers who focus on the eco-evolutionary dynamics, functional ecology, social dynamics, and

paleontology of grassland-adapted mammalian groups including ungulates, baboons, and hominins; researchers using quantitative tools (such as stable isotopes) to elucidate the origin, expansion, and ecological utilization of grassland plants by animals in both modern and paleontological contexts; researchers who study interactions between vegetation and mammalian species in modern grassland ecosystems; and researchers focused on integrating interactions in larger community contexts to understand the structure and functioning of both paleo and modern ecological networks over evolutionary time.

Why SFI? The aims of this Working Group integrate both paleontological and contemporary understandings of mammalian and grassland ecology, incorporating diverse concepts such as food web and community dynamics, foraging ecology, and the ecology and evolution of social groups - all of which operate on both ecological and evolutionary timescales. We therefore aim to bring together a diverse group of ecologists, evolutionary biologists, paleontologists, and social scientists with expertise in these disparate fields, who would not generally interact. Our goal is to produce 5-8 working papers that will address different aspects of the eco-evolutionary interplay between grasslands and mammalian communities for a special issue of - for example - *Interface Focus*, *Philosophical Transactions of the Royal Society B*, or perhaps *Oecologia*, *Journal of Ecology*, *Frontiers in Ecology and the Environment*, or a similarly-ranked journal. The first meeting of the Working Group will aim to focus on the most relevant and tractable questions, and to initiate smaller-group projects that will embody the set of papers to be tackled. We will follow-up this Working Group with a second meeting at Dartmouth College to present and synthesize the outcome of our efforts and to finalize the details of publication.

People (*Organizers)

| Name | University | Focus |
|------------------------|--------------------|---|
| Nathaniel Dominy* | Dartmouth | Dietary ecology / functional morphology / evolution |
| Vivek Venkataraman | Dartmouth | Dietary ecology / evolution |
| René Bobe | George Wash. Univ. | Paleoecology |
| Nina Jablonski / Frost | Penn. State Univ. | Paleoecology / functional morphology |
| Jacquelyn Gill | U Maine | Paleo grassland herbivore dynamics |
| Thure Cerling | Utah State Univ. | Stable isotopes / paleoclimate / African paleoecology |
| John Fryxell | Univ. Guelph | Consumer resource interactions / savanna dynamics |
| Mathias Pires | Univ. Sao Paulo | Paleo food webs / community ecology |
| Andy Dobson | Princeton | African food webs / parasite ecology |
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| Justin Yeakel* | SFI | Food webs / interaction dynamics / paleoecology |
| Jen Dunne | SFI | Food webs / paleoecology |
| Mirta Galesic | SFI | Evolution of sociality / hunter gatherers |
| Marcus Hamilton | SFI | Archaeology / body size scaling |