Proposal Status | MAIN

Organization: University of Hawaii

Review #1

Proposal Number:	1211356
NSF Program:	Extragalactic Astronomy and Cosmology Program
Principal Investigator:	Barnes, Joshua E
Proposal Title:	Merger Modeling with IDENTIKIT
Rating:	Multiple Rating: (Good/Fair)

REVIEW:

What is the intellectual merit of the proposed activity?

The means to efficiently infer the initial conditions of real-life merger events could have broad impact on the field of galaxy formation. The aims of the proposed program thus have broad relevance to understanding galaxy formation and evolution in a cosmological context, and the methods proposed to investigate the initial conditions of galaxy mergers are novel.

The IDENTIKIT 2 software at the core of this proposal, should provide an automated and efficient means to compare simulated galaxy interactions with observations - both strong features of the proposed methodology. Another strong methodological aspect is the attention paid to the uniqueness of solutions, or lack thereof. There were other aspects of the methodology that were less strong in the proposal. For example, although it was mentioned that disk scale length/height ratio would be varied, there was minimal discussion of internal galaxy structure (e.g. bulge-disk ratios, disk scale lengths, ratio of disk scale length to scale height). For example, there was no discussion about what is observationally known about the distribution of these properties in undisturbed galaxies at the redshifts most relevant to the mergers the PI is interested to reproduce.

Another concern with the methodology is the use of collisionless simulations to make predictions for the dynamics and distributions of gas - the most common observational tracer of tidal features. The Magellanic Stream has been well traced with HI, but is there evidence for (or at least not against) there being a spatial and kinematically coincident stellar stream? How would the presence of hot halos around disk galaxies affect the dynamics and morphology of gaseous tidal features?

The specific scientific questions and framework within which the results of this research would be interpreted were not adequately described.

What are the broader impacts of the proposed activity?

The proposed program will develop two tools closely aligned with its scientific goals: a web-based tool for dynamical galaxy modeling and an interactive tutorial on galaxy merging appropriate for high-school students. The former tool will be made accessible to the broader community while the second tool will be used for outreach to a local school. These two tools would be quite valuable to the community; the expanded/improved version of the existing IDENTIKIT 1 tool could impact both research in the field and provide enhanced access to students and professors seeking to bring research into the classroom.

A graduate student would be trained as part of this program. The student's specific role in the proposed work was not clear. From his Bio Sketch, it seems that Dr. Barnes has advised few (3) graduate

students in his time at the IfA at the University of Hawaii (20 years). The proposal would thus be stronger if Dr. Barnes included more a more specific description of the student's path to a dissertation through this program.

Summary Statement

Overall, providing an efficient means to infer the progenitor systems of observed galaxy interactions would be a valuable contribution to the field of galaxy evolution. Releasing an enhanced IDENTIKIT tool publicly and developing curricular materials to go with it are very strong broader impacts. However, the proposed research was not presented with very specific scientific goals, nor an adequate discussion of the viability of the simulations for making predictions for gaseous features.

With substantial experience in the field of galaxy simulations and as the developer of the Indentikit simulation tools, PI Barnes is well equipped to carry out this proposed program.

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