Research Proposal Referee Feedback Form

Astronomy 3Y03

Winter 2017

Title of Research Proposal:Colin Colterjohn

Author of Research Proposal: A STUDY OF THE EXTRASOLAR PLANETS

SURROUNDING THE PULSAR PSR 1257+12

1. Does the proposal conform to the presentation standards (e.g. 3 pages in ApJ format/5 pages in single column format, no more than 1 page of references)? If not, please comment.

The proposal’s format is missing some elements. The author’s name, as well as the page number are missing from the first page. Otherwise, the proposal does appear to conform to the standards.

1. Is the abstract understandable to a non-expert audience and sufficiently informative? Provide details to support your assessment.

The abstract is sufficiently understandable to an audience that is composed of people in the discipline of stellar astrophysics, but not experts in pulsar planets. However, the sentence “… there is a large amount of uncertainty surrounding the nomenclature ...” is a bit confusing, because while nomenclature is the process of naming things, uncertainty in the formation of the system and the existence of additional planets are physical problems, not naming problems. The abstract does well to mention the theories of pulsar planet formation, but more detail on how the theories will be analyzed would be useful. The author mentions that the white dwarf merger model for the formation of pulsars with planetary systems will be compared with a supernova remnant model, but gives no indication of how they might be compared. It would be good to describe, if only at a basic level in the abstract, what methods will be used for these comparisons.

1. Do you understand what object(s) the author is describing, and what we understand about them so far? Provide suggestions to improve the sections on recent progress and the literature review. Have the authors made enough use of the primary literature?

The author has not included a thorough literature review and description on recent progress. The description of pulsar formation is extremely brief, mentioning being “spun up” by accretion from other stellar objects, but there is no explanation of what this means, and what evidence supports it. It would be good to include a more comprehensive description of this process, and of the research that led to its discovery. Similarly, considering the importance of white dwarf mergers to this proposal, it deserves much more attention. It would be worth including a review of recent research into white dwarf mergers. Has the model of white dwarf mergers as the formation of pulsars with planetary systems stayed constant since its inception, or have there been substantial recent developments? How old is the model? Also, the supernova remnant model is mentioned in the abstract, so it should be discussed in the literature review / recent progress too. The author should cite more primary literature. Only one of the four sources is primary literature. Instead of citing the website of an undergraduate astronomy course, cite the primary literature that its information comes from. In-text citations should be added, to show which information is from which source. The author mentions in the last bullet point the topics of research that would be pertinent to a literature review for the project; it would be helpful to include a summary of this research in a literature review section.

1. Do you understand the objective of the proposed research (observation or calculation) and the methodology? Has the author been specific about what (s)he will do to answer the research question? Provide suggestions to improve these sections.

There is little detail about the objective of the proposed research. The author states that the objective is to “research the formation of pulsars through various methods, ranging from the most plausible to radical”. This is a great high-level goal, but for the purpose of this proposal, a more specific and detailed objective is necessary. Are there certain aspects of specific models for the formation of pulsars with planetary systems that the author is hoping to elucidate? In terms of methodology, it would be helpful to explain what is meant by “plausible” vs. “radical” research methods. It sounds like the author intends to compare the predictions of models with observational data. Does the author intend to make new observations of PSR 1257+12? If so, which telescope(s) will be used, and when, using what filters? How will the data be processed, and what might it show that would support or refute different models? The author mentions that after choosing a best model, it would be used to approximate the number and size of planets. It would be best to describe how this might be accomplished. What sort of data must be collected to find this information, and how does the author plan to collect it? How do different models provide information on the number and size of planets?

1. Has the author described the anticipated significance of the work in a convincing way? Provide suggestions to improve this section.

The author has not addressed the anticipated significance of the work. To write about the project’s impact, the author could consider what the state of research on pulsars with planetary systems will look like after the project is completed, and how that differs from its current state. When researchers cite this project, what information will they be taking from it? If this project definitively confirms one model and refutes all others, will research on the topic change its focus? Will venues of research be opened or closed? Would any of this contribute to a more general understanding of stellar evolution and formation?

1. Has the author clearly identified and appropriately cited work that is not their own? If not, provide clear examples where additional citations are warranted.

It is not clear where the author found which pieces of information included in the proposal, because there are no in-text citations. It is very difficult to explore the literature further, because there is no indication of what information is found where. In order to verify any piece of information contained in the proposal, it is necessary to fully read through each source until the fact is found in one of them. This is doable right now, with a short proposal and four sources, but in-text citations will be necessary for longer proposals, and are proper practice, too. There should be in-text citations in each of the proposal’s bullet points, after each piece of information taken from the work of others. In the first bullet point (“PSR 1257+12 is a millisecond pulsar...”), a citation should be provided for each of the following:

* “planetary system of at least 4 bodies”,
* “...millisecond radiopulsars are normally thought to be “spun up” by the accretion of matter...”,
* “...the pulsar was initially the result of two white dwarf stars merging […] the resulting disk of matter […] would then be crushed ...”

Similarly, each fact in the rest of the proposal should be cited, with in-text citations corresponding to entries in the references.