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Astronomy and Computing: A new journal for the astronomical computing community☆

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A B S T R A C T

We introduce *Astronomy and Computing*, a new journal for the growing population of people working in the domain where astronomy overlaps with computer science and information technology. The journal aims to provide a new communication channel within that community, which is not well served by current journals, and to help secure recognition of its true importance within modern astronomy. In this inaugural editorial, we describe the rationale for creating the journal, outline its scope and ambitions, and seek input from the community in defining in detail how the journal should work towards its high-level goals.

1. Introduction

Astronomy and Computing (A&C) is a new journal for the expanding community of people whose work focuses on the application of computer science and information technology within astronomy, rather than on astronomical research *per se*. This domain is an increasingly important part of astronomy, but one that is poorly represented in the astronomical literature, resulting in inefficient sharing of knowledge within its community and a difficulty on the part of the members of that community to establish the track record of refereed publications needed for career advancement in many astronomical institutions. The over-riding goal of A&C is to address these two problems by providing a venue for the publication of peer-reviewed papers on astronomical computing that will act as a focus for the community, aiding its progress through the effective transmission of knowledge, and helping it secure recognition of its true value to astronomy.

Some of the papers that will appear in A&C might otherwise have been published in an existing journal, but most would not, for reason of topic rather than quality. In Section 3, we outline some of the topics that fall within the scope of A&C, but that list is illustrative, not exhaustive, and we have deliberately not attempted to specify the boundaries of that scope too rigidly, because this is a rapidly changing field.

The range of topics to appear will be mirrored by the range of people writing and reading the papers. Some will be research astronomers with content to share that is of a more technical nature than what is usually published in the astronomical research literature. Some will be academic computer scientists reporting on astronomy-centred projects that are too 'applied' to find a comfortable place in the computer science literature. Many will have long track records in the application of computational techniques and technologies to astronomy, whether they started as astronomers, computer scientists or IT professionals. These groups may disagree on what they call what they do – 'astronomical software development', 'astroinformatics', 'astronomical computing', 'computational astronomy', or more – but what will be common to the papers that appear in A&C is that they focus on technical matters, not on presenting astronomical results.

In Section 2, we argue for the timeliness of the launch of A&C, whose aims and scope are outlined in Section 3. The topics listed

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there naturally lead to a set of different types of paper, as described in Section 4. Some of these may have additional online content associated with them, which we discuss in Section 5, along with other pragmatic issues relating to the publication of papers in A&C. Finally, Section 6 rounds off this editorial with an invitation to the community to help make a reality of the vision outlined here.

2. Astronomical computing as a discipline

The proponents of any new journal must justify why it is needed, and why that need is currently so pressing as to actually lead to the launch of the journal. In this section, we make the case for the necessity of creating A&C, and the timeliness of doing so now, based on the maturity of its target domain and the critical mass of the community it will serve.

2.1. The justification for A&C

Astronomy has long been a source of practically focused innovation. With the telescope, timekeeping, and computing, to name just three, astronomers have a proven record as early adopters of new technologies, often contributing generic innovation to these fields as well as acquiring the specific skills necessary to exploit those technologies in support of their own science.[1] In the cases of optics and instrumentation, and of precise timekeeping, as the technology developed it became more specialized, more removed from the perceived mainstream of astronomical research, and its specialists stopped thinking of themselves as astronomers doing technology on the side, and instead as technologists leading an independent subdiscipline of the larger astronomical project. That branching finds expression in the largely separate, but still mutually intelligible, publishing world of astronomical instrumentation, which has a thriving centre in the SPIE conference series.

This branching off, into a technologically led subdiscipline, has already happened for astronomical computing, as reflected by the longevity of the ADASS[2] and ADA[3] conference series. One difference between astronomical instrumentation and astronomical computing is that, while the community undertaking the former appears content with its current publication options, that working in the latter domain is not, as evinced by the discussion at the 'Birds of a Feather' discussion at the 2010 ADASS conference in Boston, summarized in Gray and Mann (2011).

The discussion effectively concluded that, since there were journals other than the best-known ones, which professed willingness to accept the submission of software-related papers, the community should and would migrate to these. This turned out to be overoptimistic, and nothing like it appears to have happened in fact. In any case, it is not clear that colonizing an existing journal would give the discipline the definition and visibility that it needs to help it grow, and we believe that creating this disciplinary identity is as valuable a goal as any search for professional credit.

Gray and Mann (2011) present three main reasons why the community can no longer make do with a publication mechanism centred on the unrefereed proceedings of an annual conference: (i) a conference presents a single submission deadline per year, forcing authors to publish when the opportunity arises, not when the status of their project merits it; (ii) peer review can provide a quality threshold, and the existence of guidelines will lead authors to justify and elaborate their arguments to a greater degree, producing more comprehensive papers; and (iii) a journal – and especially a predominantly online journal – will not have the space constraints that bedevil conference proceedings, and so will allow authors to give their material the detail it requires, and set it properly into its broad context of previous work in a way that is impossible in a brief conference report. However, there is no intention that A&C will replace, say, the ADASS proceedings volume: the two are complementary, serving different community needs, and both outlets are necessary to ensure that those needs are met in full.

For example, the institutions that employ many of A&C's intended authors and readers find it harder to assess personal attainment on the basis of a track record of successful projects than on a list of refereed publications, so a peer-reviewed journal is needed to provide vital support to career progression in this community. That the existing astronomical journals do not fulfil that role was demonstrated by Gray and Mann (2011), whose authors circulated for comment to the editors of the majority of them a set of abstracts of papers from the previous year's ADASS conference (not all of those papers would necessarily be appropriate for A&C — the point of the exercise was to delineate for each journal the boundary in the computational domain beyond which they would deem a paper to be too technical for their audience). The responses varied slightly between the main astronomical journals, but the key finding from this exercise was that, unsurprisingly, they view technical computational material as a means to an end – the justification of a scientific result – rather than an end in itself. Papers that focus on the technical material will struggle to find a home in the existing astronomical journals, and, when they do, they will be greatly outnumbered by 'straight' astronomical research papers, so these journals will not provide an effective means of following the progress in astronomical computing. This is an issue not only for the growing number of astronomical computing specialists, but also for computer scientists with expertise in areas (for example data mining or management of 'big data') that overlap with astronomy and who need an interface to the astronomical community. More importantly, this lack of a natural home in the peer-reviewed literature leaves the technical material underreported and underexplained: authors tone down the technical detail and play up the associated astronomical result in order to get a paper accepted, to the detriment of those wishing to understand and build upon the technical lessons learnt.

2.2. The timeliness of A&C

There are several indicators that the astronomical computing community is reaching the critical mass that calls for the launch of a journal like A&C. A number of new conference series in this domain – for example .Astronomy[4] and the international Astroinformatics conferences[5] – are becoming established and accreting communities around themselves, while the *State of the Profession Position Papers*[6] submitted to the 2010 US Astronomy and Astrophysics Decadal Survey included a number of papers (such as Borne et al. (2009)) highlighting its growing importance to astronomy. This has been also been recognized by the recent establishment by both the American Astronomical Society and the International Astronomical Union of working groups covering the fields of astrostatistics and astroinformatics which are central to the scope of A&C.

[1] The community has shown itself remarkably prescient. In an article (Brauman, 1986) in a special issue of *Science* in the mid-1980s and in Wells (1987) the community identified key technologies which have shown their longevity in practice.

[2] www.adass.org.

[3] ada7.cosmostat.org.

[4] dotastronomy.com.

[5] See http://www.astro.caltech.edu/ai12/ for *Astroinformatics 2012*.

[6] See http://sites.nationalacademies.org/BPA/BPA_049492.