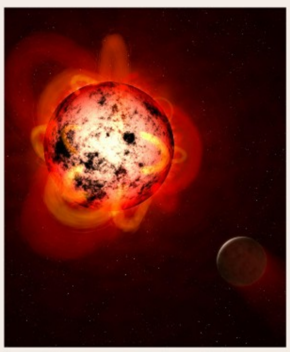
SCIENCE ASCEND

11th Issue of Science Ascend, with much improvements ahead!



Highlights

Lessons Learnt from the first 10 Issues of *Science Ascend*:

Most Popular and Potentially Overlooked Research Compilation.:

Special Focus - Lunar Thermal Sensing:

Special Focus - Venus Sensing:

Compiling Conference-Workshop Information:

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Science Ascend

Rising to New Heights of Discovery!

Science Ascend teleports you to the frontiers of science. It compiles and discuss the scientific research preprints from arXiv from the previous three months to be cognizant of the *state-of-the-art* of knowledge in astrophysics. Light from the *Science Ascend* will keep brightening the dark horizon beyond the limits of our comprehension. FIRE Araştırma Eğitim Ltd. Sti. guarantees the biannual publication and dissemination of this journal, and make it available for everyone freely.

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Bilim Yükselişi

Keşfin Yeni Yükseklerine Ulaşmak!

Science Ascend sizi bilimin sınırlarına ışınlar. Astrofizik bilgi birikiminin *en son durumu* hakkında bilgi sahibi olmak için arXiv'den geçmiş üç aydaki bilimsel araştırma ön baskılarını derler ve tartışır. *Bilim Yükselişi*'nden gelen ışık, kavrayışımızın sınırlarının ötesindeki karanlık ufku aydınlatmaya devam edecektir. FIRE Araştırma Eğitim Ltd. Şti. bu derginin yılda iki kez yayınlanmasını, dağıtılmasını ve ücretsiz olarak herkesin erişimine açılmasını garanti eder.

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Opinion Article – Guest

Maarten Roos-Serote

InterdisciPlanetary Scientist at ScienceCurve.Space

The Last Man Who Knew Everything is said to have been the British physician and polymath Thomas Young. Young was born in 1773 and passed away in 1829. During his life, he contributed signficantly to many different areas of science. Whether he actually knew "everything" is probably up for debate, but the idea that there was such a time when one could be aware of all the scientific advances in all fields is interesting and alien today. Since then, the amount of new scientific insights has increased at an ever faster pace, and today's flood of digitally available scientific results and information is potentially crushing. For any researcher, the number of published articles that are added to the to-read list on a daily basis definitely defies any person's capability to keep up. The same can be said about the number of conferences, workshops, talks, whether in-person or online: we just cannot hope to attend everything that has a flair of being interesting. All this is potentially so: in order to protect ourselves from overload, we need to make choices that sometimes result in a feeling that we miss out on something important. I guess there is no real solution to this. Using Large Language Models to help create some selection and order in the endless maze of information could be an idea. Personally, I have not yet had a chance to try that out, but it would be interesting to hear from those who have.

Science Ascend is an attempt to soften the information blow, to provide a curated selection of science results that might help pick up on interesting research otherwise missed. Güray Hatipoğlu started Science Ascend as part of his wish to serve the community and, in doing so, learn a lot himself. The initial idea to produce one issue a week, including different fields, turned out to be too much of a challenge. Therefore, starting with this current issue, the adjusted approach is to release an issue every half year and compile the most interesting results from that past half year.

At the same time, I am also looking ahead to the coming half year and compiling an overview of interesting conferences, workshops, and other events.

Enjoy this issue of Science Ascend and do let us know any feedback you might have!

Lessons Learnt from the previous 10 Science Ascend Issues

Science Ascend initially started as a weekly bulletin in 5 separate fields: astrophysics, analytical chemistry, remote sensing, environmental chemistry, and data analysis-ML (later only focused on data decomposition techniques). A week was chosen as even that period has generally a significant number of preprints (e.g., ~40 for astro-ph.EP alone) and some of them are bound to be missed out, but still beneficial. Another aim was to generate interdisciplinary insights while viewing all these 5 separate but related fields in a single PDF file.

Indeed, many classes of methods are applicable in even quite unrelated fields, and some of them are sub-optimal in their application. I have seen this quite humane problem in many different academic fields in which I was involved: analytical chemistry, food safety, lake ecology, biological and chemical remediation, and satellite remote sensing, to name a few. Hence, the primary target was utilizing the accumulated experience of a method used in a field in another field, in this case, astronomy/astrophysics. Of course, the ideal case of seeing a method amenable to being utilized in astrophysics and directly, successfully applying it is a non-trivial and time-consuming activity. As a result, this target was found to be impractical, even without mentioning the weekly publication frequency.

Another problem was again related to the weekly scope. Even if there were dozens of preprints in all five fields, a single week usually did not have extensive coverage, and sometimes even was dominated by a specific conference proceedings. This fact undermined the interdisciplinary idea generation and the ability to view the state-of-the-art in the field. As was suggested by Maarten Ross-Serote once, rather than this weekly format, a subject-specific monthly format might have been much better for this purpose. This and similar feedback, and one more thing, prompted me to reconsider the publication frequency and format of Science Ascend.

Here is that one last thing: reader base. As there are always many things on the to-read list of academicians and graduate students, another weekly to-be-read bulletin was obviously asking too much from the community. A further refined, less frequent but more to the point and specific approach felt more to the needs of the community.

Of course, Science Ascend has always evolved according to the constructive feedback and will keep doing so, hopefully covering more demands and providing requested and sought-after things to the community.

How Science Ascend will Find Popular and Potentially Overlooked Research Works?

As explained in the Opinion Article of this issue, considering the generally popular, and potentially missed, "hidden gems" within the literature will be a quite interesting contribution. In the beginning, the popularity metric should be decided to make such a separation.

The first thing that comes to mind may be citations, but as Science Ascend works at the cutting-edge and with preprints, it is not a distinguishing metric. Another way is to "read" and "download" metrics from the user interface of the NASA ADS (Astrophysics Data System) Abstracts service. [1]

From another perspective, a field-level popularity is also instrumental. In other words, the number of preprints published within 6 months in X, Y, Z… fields. Providing a list of keywords and labels manually and checking the titles (or abstracts) makes a decent grouping of preprints, such as Mars-related preprints with Martian-Mars keywords, protoplanetary disks with protoplanetary disk-circumstellar disk keywords, etc. The rest of the preprints without such keywords can be grouped by simple clustering methods or large language model applications. In this way, groups with the highest and lowest number of preprints might be examined specifically for popular and relatively less worked fields in that period[2]. In order not to choke the system, such queries/filters are to be done locally after retrieving all metadata of preprints for the period of interest, such as the last 6 months. Even in that simplicity, it is not straightforward. Here is an example for the January 1, 2025, to June 30, 2025, period from astro-ph.SR category:

1Indeed, even literature reviews themselves can be comfortable done using ads and/or arxiv API via Python interface.

2Of course, this assumes that a worked out field results in preprints, and also the number of preprints can be considered as a standard metric for popularity. There are cases that this is simply inaccurate, yet, it is the most practical and reasonable one at this point.

The keywords and their overarching category were fed as a Python dictionary to the algorithm:

```
keyword_clusters = {
  "Mars": ["mars"],
  "Mercury": ["mercury"],
  "Venus":["venus"],
  "Solar Flares": ["solar flare", "solar flares"],
     "Circumstellar Disks": ["circumstellar disk", "protoplanetary disk"],
      "Variable Stars": ["variable star", "variable stars"],
         "Clusters": ["cluster", "stellar cluster", "clusters"],
  "Supernovae":["SNe", "Supernovae"],
}
```

There were 2274 preprints in this category as a total, and manual keywords above resulted in following categories vs. number of preprints:

Category Name	Number of items
Mars	7
Mercury	2
Venus	6
Solar Flares	53
Circumstellar Disks	80
Variable Stars	29
Clusters	181
Supernovae	103

As seen in the table above, even if the user can specify his/her interest comfortably, many articles with potential low-to-high relevance may be ruled out as well. Several caveats are as follows:

-Important keywords should be completely entered.

-Cases like “hot Jupiter” should be separated from the actual Jupiter studies.

-Getting keywords from an abstract is tricky and can lead to many unrelated papers just because something is mentioned in passing while not being in the study directly, like “similar methods can be used in exoplanet studies” in a Solar system study. On the other hand, working with titles will drastically underestimate the number of preprints for a given category.

A word of caution is that the aim here is not just to make a bibliometric study, but rather to develop novel insights after grouping them and examining them separately and together. As is the case for other things planned by Science Ascend, feedback is welcome via info@fire-ae.org.

Planning, Executing, and Disseminating Interviews

Interviewing a professional from the astronomy/astrophysics field generates a diverse set of insights that are beneficial to graduate students, academicians, and also to people from industry.

The person to be interviewed may also be demanded directly from Science Ascend, or even a to-be-interviewed person from the field might approach Science Ascend directly with the topics s/he would like to provide a talk.

After specifying the person and setting the time for the interview, a set of questions is sent to the interlocutor by Science Ascend, and they may even be answered in advance. And in the actual interview, they may be elaborated, and other emerging topics may be recorded. It is also possible to directly put the interview video record on a PeerTube or similar platform, but that has not been decided yet.
Another option is conducting an interview with an audience, where in the last part of it, it will also be possible for the audience to pose questions, and even if the time does not permit, an e-mail with answers to the questions by the interviewed person may have been sent to the participants.

There are already several people who will be interviewed at the first suitable occasion, but the readers can still recommend people for an interview with them.

Focus – Lunar Thermal Sensing Methods from Earth

Thermal sensing may sound straightforward, yet there are just too many ways to retrieve thermal data from the Moon that make it impossible to call it boring. Indeed, the following examples will present not only creative but also serendipitous ways to obtain data on lunar thermal state. Without further ado, here are the means, from simple to more complex ones:

Amateur Telescopes

Maghrabi et al. (2021) made a telescope and embedded an infrared camera to track the changes in lunar surface infrared reflection within the 7 to 14 micrometer wavelength range. This range contains moon-relevant black body radiation peak wavelengths, which will also be seen to be utilized in more advanced studies in the following parts. These researchers successfully made observations with this telescope in different moon phases and partial eclipse conditions, resulting in observable thermal changes on the lunar surface.

Ground-based Telescopes (larger)

There are also studies with larger telescopes utilizing far larger wavelength ranges. Such GHz range measurements also utilize the black body radiation assumption on wavelength-to-temperature relations, but normally, their surface emissions are far too low to be even detectable. Nevertheless, since they can just penetrate the material in the surface, not the lunar surface, but a certain depth of it is integrated, and their total GHz flux is measured, which is, again, detectable with more insight into the subsurface conditions within it. Caltect Submillimeter Observatory (Pardo et al., 2005) and ESA Dresden 10 GHz radio (Chen et al., 2020) are among such studies.

Low-Earth Orbit Satellites

An interesting case (and more interesting ones will follow) is using satellite remote sensing data normally considered for earth observation purposes. Most used sensors, such as MODIS and VIIRS, or directly satellites like NOAA-18 (Müller et al., 2021), are calibrated against the lunar surface reflectance as well. This not only means the relevance of knowing the dynamic nature of the lunar surface for better, more accurate calibrations, but also the presence of lunar surface thermal data even in low Earth orbit satellite cases.

Geostationary Satellites

Compared to the occasional cases of monitoring the lunar surface by low-Earth orbit satellites, geostationary ones monitor the Moon inadvertently and more frequently, with enough impact on the data that there are routine algorithms to account for and subtract the lunar reflection. There are studies from geostationary satellites, but one from Nishiyama et al. (2022) does stand out[3]. They used 248 Moon capturings with at least half of the Moon is visible in the image from the Himawari Standard Data of Himawari-8 satellite. They derived the brightness temperature from the Advanced Himawari Imager (AHI) data and found it comparable to the Lunar Reconnaissance Orbiter (LRO) Diviner data (the longest lunar surface thermal data collected sensor). Even in one of their images where the Moon was almost in its New Moon phase, several important craters were quite distinguished in the Himawari-8 data thanks to their specific thermal characteristics.

As a last word, it is possible to collect information on the lunar surface thermal state with just naked eyes, which can give phase and even crater-related information in especially non-gibbous cases. Even more so, just looking at the calendar can give some hints about the lunar surface. Being a bit open-minded and thinking outside the box might give us much more new data from new resources.

3Even better, they carry this millions of kilometers further to study Venus with the normally Earth-observing satellite data, which will be examined in the next section specifically.

Focus – Venus Sensing from Earth

Maarten Roos-Serote

InterdisciPlanetary Scientist at ScienceCurve.Space

Nishiyama and co-authors (2025) present another original and creative piece of research in their recent paper. They use serendipitous observations of Venus acquired between 2015 and 2023 by the Japanese Himawari 8 and 9 meteorological satellites. Venus is spotted close to the Earth's limb in images from the Advanced Himawari Imager (AHI). The AHI bands cover the visible to the mid-infrared. The focus of the presented results is the nine mid-IR bands, between 6 and 14 μm. Venus is up to 5 pixels in size in these bands, hence not really spatially resolved. However, the uniqueness of this data set lies in its wavelength coverage in the mid-IR bands, albeit fairly broad bands, as well as the long time span and the phase angle coverage. It is complementary to existing data sets from the only Venus orbiter in that same time period, Akatsuki, as well as the BepiColombo Venus flyby. The instrument is regularly calibrated and has a low noise level (0.2K at 300K), resulting in very reliable measurements. Disk integrated radiances are derived from the observations. These can be compared to similar measurements from Akatsuki LIR (Long Infrared camera) and BepiColombo MERTIS (Mercury Radiometer and Thermal Infrared Spectrometer). It turns out that the temperatures derived from LIR are systematically off by some 15%. LIR has known calibration difficulties. From the measured radiances, the average temperatures in the atmosphere at the levels sounded in the wavelength bands can be derived, roughly between 60 and 80 km altitude. Since the central part of the disk of Venus dominates the radiance, the dependence of the temperature on Local Solar Time information is not averaged out and hence not lost. Combining many observations over the eight-year time period allowed Nishiyama et al. (2025) to clearly detect the thermal tide (diurnal and even semi-diurnal) and see variations over time. These could be related to variations on a decadal scale that have been seen in different datasets from previous missions. For the observations when Venus is at its maximum apparent size, the data allows the study of planetary-scale waves, their behaviour, and altitude dependence. This has not been done before in this manner. Using Earth observing satellites to also study the planets opens many interesting paths for original research, complementary to dedicated space missions and Earth-based telescope observations. It will be interesting to explore other existing archives from similar satellite missions to see what jewels can be found among them! In addition, these studies can help calibrate planetary mission instruments.

Compilation of Upcoming Astronomy-Astrophysics Conferences-Workshops

In this case, the main purpose is to reduce the time it takes for researchers to find relevant/interesting conferences that are practical/affordable to register and send abstracts. Unfortunately, this is not trivial, because not only is there not a single place that lists non-predatory conferences exhaustively, but also their websites (most have) are in different formats. Thus, finding the critical information, such as registration fee, important dates, possibility to attend and submit abstracts virtually, are in different places, sometimes even immersed somewhere around the body text.

Science Ascend devised a way to compile and present such conferences that will be applicable within the following 6 months of its publication date (i.e., if Science Ascend is published on January 1, 2026, it will list conferences that people can submit abstracts within January 1, 2026, to June 30, 2026).

Feedbacks are requested for what kind of information and in what format it would be the most comfortable for the readers.

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