Csillagászati és Földtudományi Kutatóközpont
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Guideline and examples to create a CSFK Press Release

The Research Centre aims to have a continuous presence in the press. To achieve that, we ask our research colleagues to create popular articles and press materials based on results which are high impact and/or which may be of interest to the general public.
Further topics that may be worthy of interest include news concerning large grants (e.g., winning a grant or closure of a project), instrument development, and outstanding results made by juniors and early-career researchers.
The guidelines and examples below provide assistance on how one can prepare and publish a press release.

- **Title**: we suggest using an accessible, attention-grabbing, "clickbait"-type title instead of the original paper titles (or their translations), in a "who did what with what" fashion, such as: "Astronomers hunt for near-Earth asteroids and meteors that impact the Moon".

- **Lead**: the first short paragraph is the lead, which summarizes the contents of the press release and includes the most important information from the research. The name of the research center (and the institute), project name, and topic of the article may all appear here. If the article is about a grant, the value should be indicated with numbers (rounded to the nearest million forints or the nearest hundred thousand in euros, with one decimal if necessary).
  E.g.: *"The Cosmic Effects and Risks R&D project of The Research Centre for Astronomy and Earth Sciences, which received 941.1 million forints from the European Union, comes to a successful close in December 2020. The main goal of the project is to assess the risk asteroids passing near the Earth pose to our planet. The closing event of the project will include an online Q&A section where researchers will answer questions form the press."*

- **Length**: keep the text of the press release under two pages. Please avoid complicated and overly long compound sentences, excessive use of adjectives (and overly formal passive cases in Hungarian). Please use plain and accessible language. Write the text in third person.

- **Content**: please make sure the following items are included (if applicable):
  - the goal of the research/development,
  - the broader context and relevance of the topic,
  - the results that were achieved or can be expected,
  - where the results have been, or are being, obtained,
  - if it is a consortial project, the name(s) of the other partners.

- **Timing**: if an embargo time is set or there is a desired publication date and time for the press release, make sure this is indicated and communicated properly.

- **Publication possibilities**:
  - smaller Astronomy news can be published through csillagaszat.hu at any time after internal review. We can send these out directly to the MTI (Hungarian Telegraph Office, the national press agency) and to existing contacts at leading media outlets on request.
  - however, for higher profile news that merit wider press coverage, or if we want to declare the results towards the Eötvös Research Network as funding body, then we advise to publish through the ELKH media office. In that case the primary publication platform will be the ELKH webpage: they publish both Hungarian and English versions, distribute it through MTI and their contacts, and trace the performance and reach of each published piece.
  - we can send out press releases to foreign/international addresses too (e.g., AAS, Science Daily, etc.). In that case we ask to prepare an English version or mirror the Hungarian in its entirety (including English links and captions) and send it as a separate document. The ELKH will also publish English versions.

- **Authors**:
  - The lead author's name and affiliation must always be included, irrespective if they are from the Research Centre or not. If the lead author is not from the CSFK, please name at least one local co-author as well. If there are multiple co-authors from the CSFK you can list them as contributors at the end.
  - Make sure to use the right pronouns and titles in the English text. If an author has a PhD degree, the appropriate title is Dr. For people in higher academic positions, it is Prof. Mr./Ms. should only be used for people without a doctorate. If mentioned repeatedly, you can later use last names only, without any titles.
  - Contact information: provide contact information for at least one person who is willing to answer media inquiries, such as interview requests, in tv/radio, print or online format. (Name and email; phone number is not necessary but can be helpful.)

- **Availability of the original research paper**:
  - we only publish scientific results if it is connected to an accessible scientific publication. This primarily means accepted papers, or, if it is justifiable, submitted works with preprints posted at arXiv or a similar international repository. Please indicate in the text which journal has accepted the paper (or where it has been submitted to).
  - Whenever possible, please include links to a freely accessible (e.g. arXiv) version of the paper in the text.

- **Funding**: grants and funding agencies (primarily the Hungarian ones) can be acknowledged at the end of the text.

- **Illustrations and images**:
  - include at least one image in the press release. This can be a photograph, illustration (artist's impression), a plot redesigned into a format that can be comprehended by the public (accessible/translated axis labels, etc), or a

portrait of the author (with explicit permission). Always give appropriate credits to the creator and copyright holder of the image (which is not the internet link where the image can be located).
- check the copyrights of an external illustration, and make sure that permission is given to at least noncommercial reuse, and whether attribution of the creator is required.
- One good source of illustrations and images is NASA: most of their imagery is available freely (public domain type) or with attribution.

- **Processing times and synchronization**:
  - if a press release comes without an embargo time or synchronization requirements with co-author releases then there are no strict time constraints, however, please keep in mind that copyediting and publication will still take some time. For the csillagaszat.hu website this is typically one or two days. The ELKH schedules articles multiple days in advance so in that case expect about a week until publication.
  - when you know the release time of an embargoed result and/or the press release is close to being ready, please contact us to be aware of the piece, to be able to start proofreading, to communicate the desired publication time with the ELKH media office. Both the ELKH and the MTI may copyedit the text and could ask confirmation for the changes. Therefore, it is important that the colleagues who worked on the release remain responsive throughout the process.
  - DON'T wait until the last day before contacting us, because we cannot guarantee that we will be able to process an article in just one or two days and the inevitable delays will be unpleasant for all parties involved. The MTI, the ELKH media office and we ourselves are all working on multiple assignments in parallel, and if we receive urgent requests late or not at all, then the article will likely miss the deadline and will not be synchronized with international press releases.
- **in case of media inquiries and interviews:**

  - use simple, understandable phrasing and avoid jargon whenever possible, both in oral and written (e.g., email) interviews.
  - oral interviews are always preceded by an inquiry and time check call, giving you time to prepare. You can prepare a list talking points and information that should be mentioned (name the research center and institute, name of the project, any cooperations, etc.).
  - interviews can be live or pre-recorded and edited materials. In the latter case you have the opportunity to ask to go over the questions and to rephrase your answers if you want to.
  - be prepared to talk about the background and the significance of the research, not just about the results themselves.
  - it's helpful to use everyday metaphors to make the interview more lively (e.g., "if x is as big as a house then y is as big as the entire planet", "it would take 1500 birthday candles to celebrate the arrival of the light from the source to Earth", etc).

- be aware that the questioner is almost never an expert in your field, and you may get a question you would not expect.
- a question that comes up repeatedly concerns the usefulness and utilization of the results. If your work is fundamental research, you can highlight that fundamental research is driven by the innate desire to understand the world surrounding us. Moreover, fundamental research may lead to applied science and utilization, but the timescales can be centuries long (e.g., 18-19th century celestial mechanics vs spaceflight and GPS). Technological developments necessary for fundamental science often lead to creation of new technologies and spinoffs that may be unexpected and unplanned (one example is everyday glass cooktops that are modifications of the Zerodur glass, developed for telescope mirrors)

- **Contact information**: for any questions and requests regarding press release publication, please contact **Márton Rózsahegyi** via email or by phone: rozsahegyi.marton@csfk.org, +36703796626.

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Examples

1. Press Release

Research Centre for Astronomy and Earth Sciences - Hungary

Supergiant star *Betelgeuse* smaller, closer than first thought

But we're still safe as it may be another 100,000 years until the star dies in a fiery supernova explosion, according to a new study by an international team of researchers, including a Hungarian astronomer.

Betelgeuse is one of the most recognizable stars of the winter sky, marking the left shoulder of the constellation Orion. An international team of scientists that included László Molnár, astronomer at the Research Centre for Astronomy and Earth Sciences (CSFK) of the Eötvös Research Network, took a closer look at this intriguing celestial object. Their work, published in The Astrophysical Journal, shows that it is both smaller and closer to Earth than previously thought.

The bright red supergiant has long fascinated scientists. But lately, it's been behaving strangely. "It's normally one of the brightest stars in the sky, but we've observed two drops in the brightness of Betelgeuse since late 2019," Dr Meridith Joyce from The Australian National University (ANU), leader of the study, and frequent visitor of Konkoly Observatory of the CSFK, said. "This prompted speculation it could be about to explode. But our study offers a different explanation. We now know the first dimming event involved a dust cloud. We found the second smaller event was likely due to the pulsations of the star."

The researchers were able to use evolutionary, hydrodynamic and seismic modelling to learn more about the physics driving these pulsations – and get a clearer idea of what phase of its life Betelgeuse is in. According to co-author Dr Shing-Chi Leung from The University of Tokyo the analysis "confirmed that pressure waves – essentially, sound waves—were the cause of Betelgeuse's pulsation."

"It's burning helium in its core at the moment, which means it's nowhere near exploding," Dr Joyce said. "We could be looking at around 100,000 years before an explosion happens."

Co-author Dr László Molnár from the Konkoly Observatory of the CSFK says the study also revealed how big Betelgeuse is, and its distance from Earth. "The actual physical size of Betelgeuse has been a bit of a mystery – earlier studies suggested it could be bigger than the orbit of Jupiter. Our results say Betelgeuse only extends out to two thirds of that, with a radius 750 times the radius of the sun," Dr Molnár said. "Once we had the physical size of the star, we were able to determine the distance from Earth. Our results show it's a mere 530 light years from us – 25 per cent closer than previous thought."

The good news is Betelgeuse is still too far from Earth for the eventual explosion to have significant impact here. "It's still a really big deal when a supernova goes off. And this is our closest candidate. It gives us a rare opportunity to study what happens to stars like this before they explode," Dr Joyce concluded.

The work of László Molnár was supported by the Premium Postdoctoral Research Program of the Hungarian Academy of Sciences. The study was also funded by the Kavli Institute (IPMU) of the University of Tokyo and facilitated by the ANU Distinguished Visitor's program. It involved researchers from the US, Hungary and Hong Kong, as well as Australia and Japan. Original English text: Jessica Fagan (communications officer, ANU).

Contact: László Molnár, molnar.laszlo[at]csfk.mta.hu / lmolnar[at]konkoly.hu

The article is available for subscribers at https://iopscience.iop.org/article/10.3847/1538-4357/abb8db
The preprint version is freely available at: https://arxiv.org/abs/2006.09837

Captions:

1.

The surface of Betelgeuse, as seen in the direct images of ESO's Very Large Telescope. The January 2019 image shows large portions of the star faded, which could indicate a dust cloud appearing in front of the star. (Credit: ESO/M. Montargès et al.)

2.

Brightness variations of Betelgeuse over the last 15 years. Stellar pulsation causes it to continuously brighten or fade, but the large dip in brightness in early 2020 is unprecedented. Data collected by the observers of the American Association of Variable Star Observers (AAVSO), and by the Solar Mass Ejection Imager instrument in space. The latter data was processed by László Molnár. (Credit: L. Molnár, AAVSO, UCSD/SMEI, NASA/STEREO/HI)

2. Press Release

ELKH Research Centre for Astronomy and Earth Sciences - Hungary

Meteorites remember the conditions of stellar explosions

A team of international researchers led by scientists at the Konkoly Observatory went back to the formation of our Solar System, 4.6 billion years ago, and gained new insights into the cosmic origin of the heaviest elements on the periodic table, as reported in a study published in Science.

The question of which astronomical events can host the *rapid neutron-capture process*, *r process* in short, that produce the heaviest elements in the Universe such as iodine, gold, platinum, uranium, plutonium, and curium has been a mystery for decades. Presently, it is thought that the r process can occur during violent collisions between two neutron stars, one neutron star and a black hole, or during rare supernova explosions following the death of massive stars.

Some of the nuclei produced by the r process are radioactive and take millions of years to decay into stable nuclei. Iodine-129 and curium-247 are two of such radioactive nuclei. They were incorporated into meteorites during the formation of the Sun and have an amazing peculiarity: they decay at almost exactly the same rate. This means that the iodine-129 to curium-247 ratio did not changed since their production, billions of years ago. "With the iodine-129 to curium-247 ratio being frozen in time, like a prehistoric fossil, we can have a direct look into the last wave of heavy element production that built up the composition of the Solar System" says Benoit Côté, the leader of the study.

The team calculated the iodine-129 to curium-247 ratios created by collisions between neutron stars and black holes, and compared their model predictions to the value found in meteorites. They concluded that the number of neutrons during the last r-process event that preceded the birth of the

Solar System cannot be too high, otherwise too much curium is produced relative to iodine. This implies that very neutron rich sources, such as the material ripped off the surface of a neutron star during a collision, likely did not play an important role, while moderately neutron-rich conditions, often found in ejecta from the discs that form around the merging event are more consistent with the meteoritic value.

Because nucleosynthesis predictions rely on uncertain nuclear and stellar properties, the final answer to what astronomical object was the exact source is still elusive, however, "the ability of the iodine-129 to curium-247 ratio to peer more directly into the fundamental nature of heavy element nucleosynthesis is an exciting prospect" says Maria Lugaro, who is also part of the investigating team. Any future astrophysical simulations of stellar mergers and explosions and measurements of nuclear properties will need to be tested again meteoritic constraints to reveal the source of the heaviest elements of the Solar System.

Original publication: https://science.sciencemag.org/content/371/6532/945
for publishing we suggest an artistic picture of an cosmic explosion: Explosion – Mészáros Boglárka (Hungary)
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Photo or illustation if needed

- Young Stars Surrounded by Disks of Dust ,Credit: Nasa /StSci (https://hubblesite.org/copyright))
- A Baby Binary Star in Formation , Credit: ALMA (ESO/NAOJ/NRAO), F. O. Alves et al.
- Artist's impression of a kilonova explosion of two merging neutron stars with strontium in the foreground. credits: ESO/L. Calçada/M. Kornmesser
- Artist's illustration of two merging neutron stars

  Credit https://www.eso.org/public/images/eso1733v/

Video

- merging os neutronstars, mass ejections visualisation
  - https://cloud.itp.uni-frankfurt.de/index.php/s/yA6D6yiRRewubZM
  - https://cloud.itp.uni-frankfurt.de/index.php/s/D4D5JqxFYbOciiP

Artistic paint of an cosmic explosion

- Mészáros Boglárka – Robbanás (Explosion)

3. Press Release

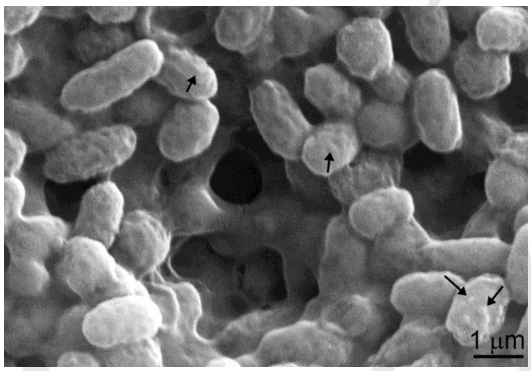
ELKH Research Centre for Astronomy and Earth Sciences - Hungary

Bacteria everywhere – novel investigations on carbonate formation mechanisms in the collaboration of researchers of earth science, biology and physics

The collaboration of researchers from the Eötvös Loránd Research Network, the Eötvös Loránd University and the University of Pannonia has resulted a new publication in one of the world's leading multidisciplinary journals, PLOS ONE.

Attila Demény (member of the Hungarian Academy of Sciences, director of the Institute for Geological and Geochemical Research, Research Centre of Astronomy and Earth Sciences) and his research group discovered a peculiar phenomenon a few years ago concerning the stable isotope geochemical data of speleothems and the hydrogen and oxygen isotope ratios of their fluid inclusions. It was found that solutions enclosed in small cavities of speleothems do not retain the $^{18}O/^{16}O$ ratio characteristics of dripping water, but show significant ^{16}O enrichment (Demény et al., 2016a; https://doi.org/10.1016/j.quaint.2015.11.137). The shift in the composition of the dripping water is caused by the precipitation of a previously unrecognized type of carbonate, amorphous calcium carbonate ("ACC"), which exchanges the ^{18}O and ^{16}O isotopes with H_2O molecules in the entrapped solution during recrystallization to calcite (Demény et al., 2016b; https://doi.org/10.1038/srep39602). The next question was, what causes amorphous calcium carbonate precipitation and why it remains stable on the speleothem surface for weeks to months while amorphous carbonate precipitated under laboratory conditions transforms to calcite in minutes?

At this time researchers in earth science and biology started collaboration, as the possibility arose that bacteria living on the surface of speleothems may be responsible for the precipitation of the amorphous material. In the framework of the NKFI FK123871 project, Nóra Enyedi and Judit Makk, researchers at the Department of Microbiology of Eötvös Loránd University, and Péter Németh, researcher at the Institute of Materials and Environmental Chemistry of the Research Centre for Natural Sciences, examined in detail the mineralogical characteristics of bacterial carbonate. In addition to the morphological and structural analysis of carbonate, microbiological studies spectacularly show the stabilizing effect of the lipid-rich bacterial organic coating. The research team published the results in Scientific Reports of the Nature journal family (https://www.nature.com/articles/s41598-020-65667-w).



Carbonate precipitation on the surface of cultivated bacteria (black arrows).

Another aspect of the extensive research on cave carbonate formations is the geochemistry of "clumped isotopes," that can be used to determine carbonate formation temperature. During carbonate

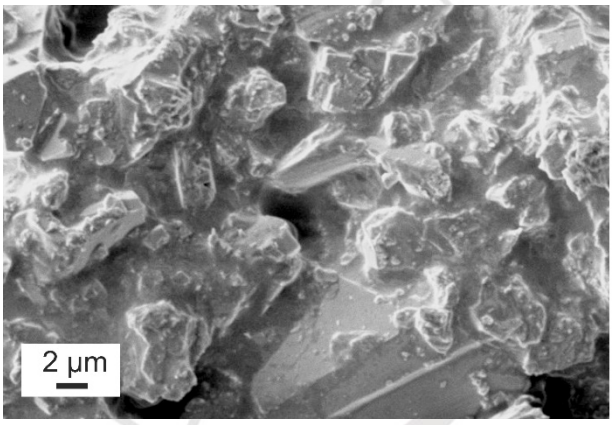
precipitation from aqueous solution, the ionic species of dissolved carbon in solution (dissolved CO_2, H_2CO_3, CO_3^{2-}, HCO_3^-) are in dynamic equilibrium with each other. With the exchange of ^{18}O and ^{16}O isotopes, temperature-dependent thermodynamic equilibrium between the different species is expected. In contrast to thermodynamic equilibrium, however, the heavy isotopes of carbon and oxygen (^{13}C and ^{18}O) are preferentially clumped and the bonds are not broken due to the higher binding strength compared to light isotopes. The higher the formation temperature, the easier the break-up and the thermodynamic equilibrium to be reached. Researchers at the California Institute of Technology discovered the temperature dependence of heavy isotope clumping in 2006, establishing a new scientific field, "clumped isotope geochemistry". The Nuclear Research Institute of Debrecen (ATOMKI) has established a laboratory suitable for measuring clumped isotopes within the framework of a GINOP project ("IKER" project, https://iker.atomki.hu).

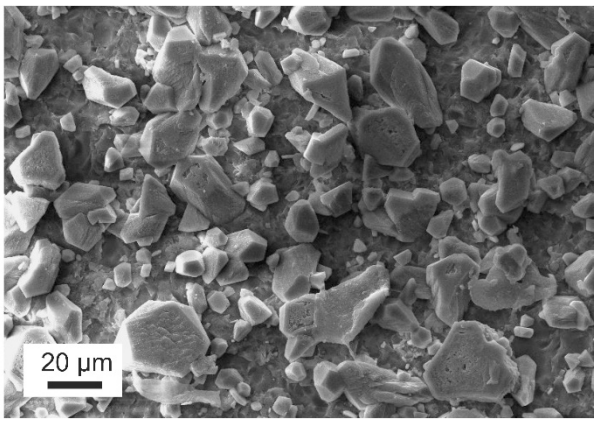
Thermo Scientific™ 253 Plus mass spectrometer and a Thermo Scientific™ Kiel IV automatic preparation unit at the Nuclear Physics Institute

The institutes began a collaboration to investigate Hungarian speleothems, and then, as a next step, to analyze the relationship between the bacterial carbonate precipitation described above and the clumped isotope compositions. The results obtained on speleothems differed significantly from the expected compositions for the given cave temperatures, suggesting that bacterial carbonate precipitation may have influenced the degree of heavy isotope clumping. Researchers in earth sciences and microbiology then used the Baradla Cave as a natural laboratory and, with the permission and assistance of the Aggtelek National Park, sampled and analyzed the carbonate precipitated on site. The essential condition of cave research is the participation of licensed cave research professionals, in this case Szabolcs Leél-Őssy, a lecturer at Eötvös Loránd University.

Germicide lamp and carbonate sampler in the Baradla Cave (Photo: Ágnes Berentés)

To demonstrate the effect of bacteria on carbonate formation, the sampling surface was illuminated with a germicide (cell-killing) lamp at a sampling point and a control point was kept untreated during the sampling period. The micromorphological characteristics of the collected carbonate samples differed drastically. In contrast to the irregular appearance of biogenic carbonate coated with biofilm, well expressed calcite crystals precipitated from the dripping water on the UV-treated surface. Clumped isotope compositions, in contrast, did not show a systematic relationship with UV treatment. The special composition of the studied speleothems is thus a consequence of the isotope fractionation processes taking place in the dripping water migration pathway, which provides essential information on the paleoclimatological applicability of the speleothems (see the research group's publication in PLOS ONE; https://doi.org/10.1371/journal.pone.0245621). Research is continuing, genetic analyzes are being conducted to study the effects of cave bacteria, sampling is beginning in other regions of the world, and new scientific collaborations are already starting. The “NANOMIN” project of the Excellence Cooperation Program (KEP-1/2020), launched by the Hungarian Academy of Sciences and financed by the Eötvös Loránd Research Network in 2020, has resulted in a breakthrough in interdisciplinary research in addition to connecting research institutes and universities.





Carbonate with irregular morphology and covered by biofilm (left, control site) and abiogenic calcite crystals (right, UV-treated site).

Publications

Demény, A., Czuppon, Gy., Kern, Z., Leél-Őssy, Sz., Németh, A., Szabó, M., Tóth, M., Wu, Ch-Ch., Shen,Ch.-Ch., Molnár, M., Németh, T., Németh, P., Óvári, M. (2016a): Recrystallization-induced oxygen isotope changes in inclusion-hosted water of speleothems – Paleoclimatological implications. Quaternary International, 415, 25-32.

Demény, A., Németh, P., Czuppon, Gy., Leél-Őssy, Sz., Szabó, M., Judik, K., Németh, T., Stieber, J. (2016b) Formation of amorphous calcium carbonate in caves and its implications for speleothem research. Scientific Reports, 6:39602, DOI: 10.1038/srep39602

Demény, A., Rinyu, L., Németh, A., Czuppon, Gy., Enyedi, N., Makk, J., Leél-Őssy, Sz., Kesjár, D., Kovács, I. (2021) Bacterial and abiogenic carbonates formed in caves – no vital effect on clumped isotope compositions. PloS ONE 16(1): e0245621.

Enyedi, N.T., Makk, J., Kótai, L., Berényi, B., Klébert, S., Sebestyén, Z., Molnár, Z., Borsodi, A.K., Leél-Őssy, S., Demény, A., Németh, P. (2020) Cave bacteria-induced amorphous calcium carbonate formation. Scientific Reports 10, 8696.