



IAU Office of Astronomy for Development Annual Call for Proposals 2021: Stage 1 Application

If you need support for accessibility, please write to us at projects@astro4dev.org.

Although the OAD is a global office, English is the official working language of the OAD. We request that all applications be submitted in English. For translation assistance, please contact us at projects@astro4dev.org at least 2 weeks before the application deadline.

Before you begin your application, please read the Full Text of the Call at <http://www.astro4dev.org/aboutiauoad/cfp/>. It is also highly recommended that you read the 'Getting Started' section, and ideally complete the [online short course on Astronomy for Development](#) to help you develop your proposal.

Questions marked with * are compulsory.

Only online applications will be accepted. For any questions or issues, please write to us at projects@astro4dev.org

1. First Name and Surname *

Ron Rhino

2. Email *

ronrhino@infraredastronomy.org

3. Project Name *

Astronomy for wildlife conservation

4. Project Abbreviation * (max. 10 characters)

Please provide a Short Code to refer to project

Wildlife

5. Which countries will your project target? * (max. 200 characters)

South Africa, and southern Africa

6. In which languages will your project be delivered and/or written? * (max. 200 characters)

English

7. Choose the primary target audience for your project *

Note that simply reaching a large audience does not lead to larger impact.

- Universities
- Schools
- Public
- Industry
- Government/ Policymakers
- Other (please write) – Conservationist

8 a. Have you or any of your team members submitted this same idea in previous years? If Yes, what was the title of that proposal? * (max. 100 characters)

No

8 b. Are you building upon previous work, done either by you or others? If Yes, please provide more details or a link to the project. * (max. 500 characters)

search [OAD database of past projects](#) and [project resources](#)

Yes. We are building on the infrared image detection of wildlife by Longmore et al. 2017 (<https://arxiv.org/abs/1701.01611>)

8 c. Will your proposal be a pilot project for one of the below **Theme(s)**?

- [Sustainable local socio-economic development through Astronomy](#)
- [Science diplomacy through Astronomy: Celebrating our Common Humanity](#)
- [Knowledge and Skills for Development](#)
- COVID-19 and astronomy for development
- Technical (technology or techniques from astronomy)**
- Not related to the above

8 d. Are you applying for a multi-year project?

Funds for multi-year projects will be released on an annual basis subject to a performance review by the OAD

- Yes (up to 3 years)
- No

8 e. Please justify the need for a multi-year project. * (max. 500 characters)

What is the duration of your project. And why should we fund a multi-year project rather than for 1 year.

2 years. The project will be undertaken by astronomy PhD students under the supervision of the project proposer, and will be doing this as a side project to their astronomy research. Due to the academic schedules, they will not be able to complete the project in 1 year or less. To develop, test and complete the project, we envisage a 2-year timescale.

9 a. Project Summary * (max. 3000 characters)

include the core project idea, target audience, implementation plan.

This project involves modifying and applying machine learning algorithms from infrared galaxy surveys to infrared drone-based surveys of conservation parks. The algorithms we use for detecting galaxies are sufficiently advanced to differentiate between spirals, elliptical and a selection of sub-categories of irregularly shaped galaxies, and can do so at very low levels of dynamic range. This project will adapt these algorithms to be used in near real-time on infrared images acquired by drones to detect wildlife against bush background, and furthermore, for animals of mass > 100kg, we hope that speciation (i.e categorisation between e.g. rhinos and elephants) will be possible.

9 b. how will you implement your project if travel and/or social distancing restrictions are in place in 2022 (or other COVID related impact)? (max. 500 characters)

what is your contingency plan? can your project be modified or adapted successfully?

This is a technical project, most of which can be done by individual researchers in the team from behind their computers. Meetings with conservationists will be organised in a virtual format, so we will have relatively low impact from Covid or lockdowns.

10 a. Describe the developmental challenge you aim to address in this project (max. 1000 characters)

For example, poor educational outcomes at school level, high poverty etc. Include references where possible.

Every year more rhinos are poached, and the numbers are now dwindling well below 30 000 across the globe. As rhinos, together with other large herbivores are key to balance in these ecosystems, their demise is worrying for conservation of life on earth. This is the key reason that we have put together this project which hopes to track the movement of large herbivores in near-real time. Another challenge that can potentially be solved as a by-product of this work, is the overgrazing and overpopulation of certain large herbivore groups, e.g. elephants.

10 b. To which of the Sustainable Development Goals (SDGs) will your project respond ? Choose up to 3 SDGs.*

Select a maximum of up to 3 SDGs relevant to your project. For detailed descriptions of the SDGs, please visit the [UN website](#) and look at the [SDG indicators](#)

1. Poverty– End poverty in all its forms everywhere
2. Hunger– End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
3. Health– Ensure healthy lives and promote wellbeing for all at all ages
4. Education– Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5. Women– Achieve gender equality and empower all women and girls
6. Water– Ensure availability and sustainable management of water and sanitation for all
7. Energy– Ensure access to affordable, reliable, sustainable and modern energy for all
8. Employment & Economic Growth– Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all
- 9. Infrastructure & Innovation– Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation**
10. Inequality– Reduce inequality within and among countries
11. Urban Safety & Welfare– Make cities and human settlements inclusive, safe, resilient and sustainable
12. Production & Consumption– Ensure sustainable production and consumption patterns
13. Climate Change– Take urgent action to combat climate change and its impacts
14. Marine Conservation– Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- 15. Environment preservation– Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss**
16. Peace, security, equality– Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17. Implementation– Strengthen the means of implementation and revitalise the global partnership for sustainable development

10 c. How will you achieve these goals using Astronomy * (*max. 1000 characters*)

We plan on using image detection algorithms and machine learning techniques that we have developed for an existing astronomy research project, and adapting them for different input data in

order to impact on wildlife conservation. This is a new and innovative project that has the potential for far-reaching implications in both conservation, and across fields, i.e. in understanding animal social behaviour, as well as deforestation.

11. What are the intended Deliverables of your project? * (max. 1000 characters)

List major deliverables such as workshops, events, educational kits, presentations, lectures, videos, manuals etc. Multi-year proposals must provide a list of intended deliverables for each year.

The key project deliverables are:

- Project website containing a link to code, various blogs and project highlights
- Open source code for detection of animals > 100 kg in infrared drone images of scale 1m/pixel or less
- Open source code for tracking of animals > 100 kg across time series of infrared drone images of scale 1m/pixel or less
- Open source code for special identification of animals > 100 kg in infrared drone image of scale 1m/pixel or less.

12. Budget

Please complete in EURO. Proposals selected for Stage 2 will be requested for a detailed budget breakdown.

12 a. Total Project Budget (EURO) [numbers only] *

EUR 6000

12 b. Total funds requested from IAU (EURO) [numbers only] *

EUR 4000

12 c. Comments on budget * (max. 1000 characters)

such as the main expenses, where will you source remaining funds etc. Multi-year proposals must comment on the main expenses for every year of the project.

1st year of project:

- EUR 3000 Drone
- EUR 1000 Infrared imager
- EUR 500 computation time on Amazon Web Services
- EUR 500 web setup and hosting

2nd year of project:

- EUR 1000 access to other infrared datasets for testing and quality assurance

We already have a grant of EUR 2000 from the World Wide Fund for Nature (WWF), so are requesting the difference (i.e. EUR 4000) from the IAU.

13. Why should we fund your project? * (max. 1000 characters)

This is an opportunity for you to motivate why your project should be selected. You could for example include details such as the need for your project around your target location/audience, how your idea is innovative, confirmed collaborators or any other information you may think would convince us to fund your project.

While rhinos once roamed the African continent in abundance, there are now less than 27000 rhinos worldwide (worldwildlife.org/species/rhino) and that number is dwindling every year because of poaching. Rhinos are important in shaping the ecosystems which they inhabit, along with other large and medium-sized herbivores. Being able to track rhinos quickly and inexpensively through their particular heat signature allows conservationists to stay one step ahead of poachers.

We envisage that the software and hardware combination developed through this project will have an impact beyond rhino conservation. If our techniques of species heat fingerprinting are successful, they could be used also to track migration of large herbivore on their seasonal migration paths, or to better plan urban sprawl in regions where humans and large herbivores live in close proximity.

Our team received a Special Technology Award to the value of EUR 2000 from the WWF ([link here](#)), which recognised the work we have done on the real-time detection of rhinos. Funding from the IAU will be essential to test and deploy this software on a wide range of infrared cameras fitted to drones.

Thank you for submitting a Stage 1 application to the 2021 OAD Call for Proposals. For any questions or issues, please write to us at projects@astro4dev.org