REGISTRATION FORM FR CZECH SCIENTIFIC INSTITUTION

1. Research institution data (name and address):

Biology Centre, Czech Academy of Sciences, Institute of Parasitology
Branišovská 1160/31
37005 České Budějovice
Czech Republic

2. Type of research institution:

Public research institution – Czech Academy of Sciences (veřejná výzkumná instituce – Akademie věd České republiky)

3. Head of the institution: prof. RNDr. Libor Grubhoffer, CSc., Hon. D.Sc., dr. h. c

4. Contact information of designated person(s) for applicants:

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5. Research discipline in which the strong international position of the institution ensures establishing a Dioscuri Centre:

Life Sciences: *Human and animal immunology and infection* - immunity, immune disorders, immunotherapy, infectious and invasive diseases, microbiology, transplantology, allergology

6. Description of important research achievements from the selected discipline from the last 5 years including a list of the most important publications, patents, or other results:

1) We demonstrated that the Myxozoa emerged almost 700 MYA and that bryozoans and annelids served as original hosts. The results transformed our understanding of the origins and evolution of parasitism in this group. (Holzer et al., 2018)

2) We focussed on reconstructing amoebozoan phylogeny. We used 325 genes and morphotypes of 61 taxa to address major questions regarding diversification and evolution of this supergroup (Kang et al., 2017). Phylogenetic analysis based on 250 genes resolved the deepest nodes in the earliest amoebozoan linages (Lahr et al., 2019). We demonstrated that the major lineages of testate amoebae diversified before the Sturtian glaciation (720 MYA).

3) Environmental DNA studies revealed unexpected pseudocryptic diversity within the arcellinid genus *Nebela* (Singer et al., 2018). We explored how climate and geographical processes are linked to major diversification events in *Hyalosphenia papilio*, where patterns of biodiversity are correlated with the history of habitat expansions (Singer et al., 2019). More recently, we focussed on devastating chytrid fungus pathogenic for amphibians, *Batrachochytrium dendrobatidis*. We showed that it forms phylogenetic lineages, which vary in geographical extent and virulence, and we developed a genotyping method to understand their distribution and interaction (Byrne et al., 2019). This will allow us to better track pathways of disease spread in this system and link specific pathogen lineages to outbreaks in wild populations.

4) In *Ceratonova shasta,* we investigated changes in morphology and motility gene expression during host invasion, migration and proliferation of virulent *versus* non-virulent strains, and identified rapid parasite multiplication, fast bleb-based migration and strong adhesion as important virulence mechanisms (Alama-Bermejo et al., 2019). The kinetics of the presporogonic development of *S. molnari* was characterised in parallel to analysing the kinetics of host responses (Korytář et al., 2019). Following an initial covert infection period, we observed parasite multiplication associated with a massive lymphocyte response, specific antibody production and a parasite-mediated switch to an anti-inflammatory response. Investigations into *S. molnari*-carp interactions also revealed previously unknown mechanisms of host erythrocyte exploitation, leading to hemolytic anemia.

Holzer A., et al. (2018) The joint evolution of the Myxozoa and their alternate hosts: A cnidarian recipe for success and vast biodiversity. *Molecular Ecology* 27: 1651–1666.

Kang S., et al. (2017) Between a Pod and a Hard Test: The Deep Evolution of Amoebae. *Molecular Biology and Evolution* 34: 2258-2270.

Lahr D.J.G. et al. (2019) Phylogenomics and Morphological Reconstruction of Arcellinida Testate Amoebae Highlight Diversity of Microbial Eukaryotes in the Neoproterozoic. *Current Biology* 29: 991–1001.e3.

Singer D. et al. (2018) Environmental filtering and phylogenetic clustering correlate with the distribution patterns of cryptic protist species. *Ecology* 99: 904-914.

Singer D. et al. (2019) Dispersal limitations and historical factors determine the biogeography of specialized terrestrial protists. *Molecular Ecology* 28: 3089–3100.

Byrne A.Q et al. (2019) Cryptic diversity of a widespread global pathogen reveals expanded threats to amphibian conservation. *Proceedings of the National Academy of Sciences USA* 116: 41.

Alama Bermejo G., Holzer A., Bartholomew J. (2019) Myxozoan Adhesion and Virulence: Ceratonova shasta on the Move. *Microorganisms* 7: 397.

Korytář T. et al. (2019) The kinetics of cellular and humoral immune responses of common carp to presporogonic development of the myxozoan *Sphaerospora molnari*. *Parasites & Vectors* 12: 208.

7. List of no more than 3 important research projects in the selected discipline awarded in national and international calls to the institution in the last 5 years:

AQUAPARA-OMICS: Aquatic parasitism meets biomics - addressing key biological questions using novel datasets and modern analytical tools (2019-2023)

PI - Prof. Tomas Scholz

Source of Funding: Czech Science Foundation

budget 47 million CZK (1,88 million euro)

New Tools for Advancing Model Systems in Aquatic Symbiosis (2020-2023)

PI - Prof. Julius Lukes

Source of Funding: Gordon and Betty Moore Foundation

budget 11 million CZK (440 000 euro)

ERDF/ESF Centre for research of pathogenicity and virulence of parasites (No.CZ.02.1.01/0.0/0.0/16_019/0000759) (2017-2022)

Co-PI - Prof. Miroslav Oborník

budget (for BC) 100 million CZK (4 million euro) (total budget for the consortium 250 million CZK; 10 million euro)

8. Description of the available laboratory and office space for a Dioscuri Centre:

Six regular offices and one large student office, a fish dissection lab, DNA lab, RNA lab and protein lab, a fish facility with two independent recirculation aquaculture systems (RAS) of 34 tanks with experimental aquaria between 40 and 100 liters, that can also be kept on flow. Two additional quarantine tanks. RAS have charcoal filter, full UV and ozone purification system.

9. List of the available research equipment for a Dioscuri Centre:

The Institute of Parasitology has research equipment that caters to most experiments being conducted within the field selected including those for qRT-PCR - the QuantStudio 6 (Thermofisher) and LightCycler 480 (Roche) , ELISA plater reader Tecan, and BioRad ChemiDoc Gel Imaging System (2x). Equipment associated with microscopy that are available include fluorescence microscopes Olympus BX 53 and BX 60, confocal microscopes FV3000 and FV1000, Binocular microscope SZX12 and Bioluminescent microscope LV200. As part of the equipment associated with the Electron Microscopy Unit that is part of the Institute are available the following instruments – Transmission Electron Microscopes JEM-1400 JEOL and JEM-2100F JEOL; Scanning Electron Microscopes JSM-7401F JEOL and Apreo ThermoFisher Scientific. Also available is a Photobioreactor FMT 150 PSI (Photon Systems Instrument). FACS instrument that is available is the BD FACS Canto II. The Institute has both BSL-2 and BSL-3 associated equipment as well including laminar flow cabinets, centrifuges, autoclaves and animal housing facility equipment. For culturing are available various orbital shakers including 2 large Innova Incubation shakers. Besides all those mentioned most standard benchtop equipment including PCR cyclers, gel electrophoresis units, incubators catering to various temperatures and gases, water baths and electroporators are available. Animal house facility available.

10. List of the additional benefits (other than listed in the conditions for hosting a DC, see invitation) that the Institution declares to provide for a Dioscuri Centre (i.e.: additional funds, personal benefits, dual career options, relocation support or other):

- Childcare on campus
- Support of leisure time activities
- 1 extra week of holiday, i.e. 5 weeks of paid holiday per year in total
- Subsidized lunches in our canteen
- Benefits from Social fund
- Full health insurance
- Opportunity to take part in mentoring programmes as a mentor or a mentee
- Concessionary mobile tariff at the contractual operator
- Concessionary banking services at the contractual bank
- Support in transferring to the Czech Republic and onboarding
- Close collaboration with the University of South Bohemia
- Other benefits will be negotiated

11. Other information about the internationalization of the research institution, international researchers employed at the institution, the availability of English language seminars etc.:

In 2019, Biology Centre CAS was awarded a 'Human Resources Excellence in Research' Award of EU and, recently, the institution has also adopted a Gender Equality Plan. Biology Centre is an equal opportunity employer with highly developed care of Czech and a great number of foreign employees as 25 % of our researchers come from more than 30 different countries. The Department of Ecology is a diverse environment including undergrads, PhD students, postdocs and researchers from 11 nationalities.

In order to enable better communication at the institution, there are courses of English for Czech employees and courses of Czech for foreign employees available, free of charge. The institution has been translating all key documents and information into English.

The institution is also a member of the ALTER-net, ELIXIR, Czech-Bioimaging, Euro-Bioimaging and EFSA research networks.