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Annex No. 10 to the MU Directive on Habilitation Procedures and Professor Appointment Procedures

HABILITATION THESIS REVIEWER'S REPORT

Masaryk University	
Applicant	Mgr Lukáš Čajánek, PhD
Habilitation thesis	Molecular Control of Primary Cilium by Distal Appendages and Associated Proteins
Reviewer	Assoc Prof Alexander Dammermann, Privatdoz, BA, MA, PhD
Reviewer's home unit, institution	Max Perutz Labs, University of Vienna

Dear Prof. Dr. Beneš,

Please find below my assessment of the qualifications of Dr. Lukáš Čajánek for representing his field in research and teaching, as required by the rules and regulations for a habilitation at Masaryk University. My assessment is based on the criteria of research quality, originality and independence and concerns solely the habilitation thesis and publications contained therein.

Assessment

Quality
Dr. Čajánek's primary research publications included in this thesis appear in leading journals including Science, PNAS and the Journal of Cell Biology, as well as in Cytoskeleton and Molecular Biology of the Cell, all journals with the highest editorial standards. These and other publications co-authored by him certainly meet that standard. His habilitation thesis is likewise professionally written. However, what I was missing was a broader discussion of centriolar appendages from an evolutionary cell biology perspective. While key studies such as Wei et al., Nat Commun 2013 (describing role of FBF1 in recruitment of the IFT machinery in *C. elegans*) are mentioned, there is no hint in the thesis that structures commonly believed to be central to centriole to basal body conversion and initiation of ciliogenesis in vertebrates, the distal appendages, do not appear to exist in invertebrates such as *C. elegans* or *Drosophila*, with no apparent ill effects on the ability of these species to form cilia. This blind spot is not unique to the candidate (the entire field appears to be happily ignoring this awkward fact), but understanding the consequences of this secondary loss of these centriolar structures is likely to be key to understanding the specific contribution of what are after all highly conserved structures that originated in the last common ancestor of all eukaryotes and conserved in most extant lineages.

Originality
Dr. Čajánek's work is primarily concerned with the assembly and function of cilia, cellular projections emanating from centriole-derived basal bodies which play important roles in mammalian development and adult tissue homeostasis. In his post-doc with Erich Nigg, Dr. Čajánek identified TTBK2 (Tau tubulin kinase 2) as a key effector of the centriolar distal appendage protein CEP164 in the initiation of ciliogenesis. His landmark 2014 PNAS paper,

along with concurrent work from the labs of Bryan Tsou and Aimin Liu (Tanos et al., Genes Dev 2013; Ye et al., PNAS 2014), represents a major breakthrough in our understanding of centriolar appendages and their role in the early events surrounding basal body docking and the assembly of ciliary structures. In his own lab, Dr. Čajánek has built on this foundation to identify and characterize other targets of TTBK2, including the microtubule depolymerase KIF2A (Vysloužil et al., Cell Commun Signal 2025). It is fair to say that along with Sarah Goetz, a former post-doc of Kathryn Anderson now at Duke University, he can be considered one of the world experts on TTBK2, a central player in cilium biology, yet also one whose cellular targets are still incompletely understood. Beyond TTBK2, Dr. Čajánek's lab has also investigated other aspects related to cilium assembly, including the role of another kinesin, KIF14, in the recruitment of centriolar appendage proteins and IFT-dependent axoneme extension (Pejskova et al., J Cell Biol 2020). This is an area of clear biomedical relevance that is likely to remain a major research focus for years to come. Given his undoubted expertise in basal body and cilium biology, Dr. Čajánek is therefore well placed to (continue to) make important contributions.

Independence
Dr. Čajánek has been an independent group leader at Masaryk University since 2017, having returned there in 2015 following a PhD with Ernest Arenas at the Karolinska Institute in Stockholm and a post-doc with Erich Nigg at the Biozentrum in Basel. Based on his website he currently leads a team of four post-docs, three Master's students and a technician, supported by funding from the Czech Science Foundation and individual fellowships. Two PhD students as well as several Bachelor's and Master's students have already successfully defended their theses. Their work can be found in numerous publications included in this habilitation thesis on which Dr. Čajánek is generally corresponding author. He has also been instrumental in the cell biology community as a co-organizer of the annual Czech Cilia Meeting, which I have had the pleasure to attend in previous years. This is clearly a respectable track record for someone seeking a habilitation/promotion to associate professor. As befits someone seeking to teach independently at the university level, Dr. Čajánek has also been involved in teaching lectures and practical courses at Masaryk University on topics in which he is an expert (animal biology, cell signaling), although perhaps not as much as one might expect for someone at his career stage.

Reviewer's questions for the habilitation thesis defence

I apologize for being unable to attend the public defense on 15 May. However, the following questions to the candidate may serve to stimulate discussion at the defense:
Q1. Morphologically recognizable distal appendages as described the candidate are missing in insects and nematodes and associated proteins (conserved in some cases across eukaryotes) have been secondarily lost, yet ciliogenesis appears unaffected. What does this suggest regarding their specific contribution to this process?
Q2. Where proteins are highly conserved, e.g. CEP164 also found in *Chlamydomonas*, would investigating conserved aspects (localization, interaction partners, phenotypes) shared between distantly related species not help in uncovering their fundamental role in the cell?
Q3. If TTBK1, a kinase highly similar to TTBK2 yet not recruited to mother centrioles, nevertheless regulates ciliogenesis as reported by the candidate (Bino and Čajánek, SciRep 2023), how might it perform that function?
Q4. What is known about the function of TTBK1 more generally, and, given the reported similarity between TTBK1 and 2 in their kinase domain, does this provide any hints as to the function of TTBK2?
Q5. What anchors the basal body-cilium complex to the cell cortex/plasma membrane? At least in *C. elegans* it is not the appendages (as those are missing) and it is not the transition zone (as Y-links and membrane connections can be absent without affecting positioning of

the cilium, e.g. Williams et al., J Cell Biol 2011). Would acute degradation of a critical appendage protein such as CEP164 detach the cilium from the cell cortex in vertebrates?

Conclusion

As detailed above I consider the habilitation thesis entitled "Molecular Control of Primary Cilium by Distal Appendages and Associated Proteins" by Lukáš Čajánek to **fulfil** the requirements expected of a habilitation thesis in the field of Molecular Biology and Genetics.

Date: 3 May 2026 Signature: