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Report Habilitation Thesis, Dr. J. Prchal

I was asked to review the scientific achievments of Dr Jiri Prchal in view of his Habilitation process and wish to provide herewith my assessment.

I know Dr Prchal since approximately ten years, when I was chairman of the European High Pressure Research Group (EHPRG). Dr. Prchal attended several of the annual meetings of the EHPRG, later was a member of the EHPRG committee, and finally organised himself the very successful 2019 EHPRG meeting in Prague. I have hence followed Dr Prchal's work and feel sufficiently competent to judge his capabilities. I should underline that I have never collaborated or published with him and I think I can claim to write this letter without any bias.

Dr. Prchal devoted his whole carrer to the study of effects of high pressure on magnetic materials, mostly intermetallics. In his early carrer he studied the hexagonal compounds of the RTAl type where R is a rare earth and T a transition metal. He investigated the pronounced anomaly in the c/a ratio as a function of temperature and studied its high pressure behaviour in RNiAl with R=Tb and Gd. He then became interested in the RT_2X_2 ternary compound where X is a p-element (R=rare earth, T=transition 3d/4d/5d element), such as $CePd_2Al_2$ $CePd_2Ga_2$, $PrRu_2Si_2$, $YbAu_2Si_2$, $EuRu_2P_2$ where he carried out magnetisation, resistitvity, specific heat as well as diffraction measurements to establish their p-T phase diagram and disclose their physical properties under these condtions. Dr Prchal was also interested in the group of cubic intermetallic of Laves type RCo_2 (R as above) with a focus on the behaviour of "pari-magnetism" in these compounds under pressure, specifically in $HoCo_2$ and $ErCo_2$, $DyCo_2$ and $TmCo_2$. A further field of J. Prchal's research concerns uranium compounds of type UPd_3, $U_3Fe_4Ge_4$, the ferromagnetic uranium trihydride UH_3, as well as the antiferromagnetic U_2Ni_2Sn. Finally, the interplay between superconductivity and quantum criticality in $CeRhIn_5$ and $CeRhSi_3$ became part of his research activity. Although most of his work is experimental, some of his studies were complemented by first-principle calculations through a collaboration with theorists.

Dr Prchal is without doubt an excellent phyisicist with a deep knowledge on magnetism and the effect of pressure on it. Over the years he has gained in this field a solid international visibility which will allow him to attract collaborations on an international scale. Dr. Prchal has directed the work of several PhD and diploma students which attests his abilitiy as a PhD adviser, an undispensible prerequisite for obtaining an habilitation degree.

High pressure experimental physics is strongly connected to mastering particular techniques, having a high degree of dexterity and a high limit of frustration. Dr. Prchal has without doubt these capabilities which promises a fruitful carreer.

I should mention that I have listend to several talks of Dr Prchal and can confirm that he is a very good speaker. He is also an excellent organiser, as he demonstrated in the 2019 EHPRG conference which he organised and which was a true success.

Dr Prchal has published some 70 papers in international peer reviewed journals. His h-factor is 10, which is quite respectable for a young scientist in our field, 15 years after the PhD degree.

I have checked the originality of the thesis using the *Turnitin* software and it is clear that the thesis represents an original work with the only overlap with the existing literature written by the author.

For all these reasons I strongly support Dr. Prchal's Habilitation and hope the jury will grant it.

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