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Dear Professor Jan Trlifaj

With this letter I should like to respond to your request for an evaluation of RNDr. Svato-pluk Krysl in connection with the procedures for his habilitation. I have reviewed his habilitation thesis, and let me right way conclude, that I find this work of a very high international standard; Dr. Krysl has worked very independently and consistently on the topic of symplectic spinors, and he has obtained many new and interesting results in this area. I certainly find him qualified for appointment as associate professor. The published record of Dr. Krysl is in MathsciNet listed, beginning 2004, as 19 publications with 35 citations from 13 authors - a quite impressive amount of papers, and given the quality of the work, the number of citations could easily be higher.

The general area of research of Dr. Krysl is differential geometry, in particular symplectic differential geometry, with the clear aim of finding analogues of as many as possible of the deep results known in Riemannian and spin geometry. Thus he has worked on and developed further previous results by Kostant and Habermann on metaplectic structures on manifolds, symplectic Dirac operators, and other differential operators naturally associated such manifolds. This is explained in the first 5 sections of the thesis (33 pages, including a list of references), and the selected 10 articles, that are enclosed in the thesis.

One considerable challenge in treating symplectic spinors and the corresponding Dirac operator is that now one has to work with vector bundles of infinite fiber dimension, namely corresponding to the celebrated Segal-Shale-Weil (or oscillator) representation, and hence the analysis becomes significantly harder. This is also the case for some of the representation theory needed, such as for example decomposing tensor products of representations. But this is solved by Krysl and the analogue of Howe-type duality is found using an orthogonal superalgebra. Using this he defines higher symplectic spinor bundles and gives detailed formulas for the symplectic twistor operators. He here develops quite a bit of the analogues of the Riemannian theory of Dirac, twistor, and Rarita-Schwinger operators.

A more systematic approach is given by Krysl for finding first order invariant operators in projective contact geometry; again the relevant tensor products and higher symplectic modules are found, and a complete classification of the first order operators is given.

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In short form, some of the key results in the articles enclosed in the thesis are

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- (1) Tensor products of symplectic modules with bounded multiplicities
- (2) Symplectic analogues of the classification by Fegan in Riemannian geometry
- (3) Decomposing explicitly the curvature tensor on a symplectic spinor bundle
- (4) Finding a natural complex on spinor valued differential forms
- (5) Proving ellipticity of parts of symplectic twistor complexes
- (6) Studying symplectic Killing spinor fields, e.g. their vanishing on the two-sphere
- (7) Howe duality for symplectic spinor valued forms
- (8) Constructing an elliptic de Rham complex corresponding to the oscillator representation
- (9) Giving an abstract Hodge theory for complexes over operator algebras
- (10) Extending results of Fomenko and Mishenko on elliptic complexes.

Overall, the work of Dr. Krysl shows mastery of a great variety of topics within the area of differential geometry and representation theory, including advanced topics such as Hodge theory over C^* -algebras; one also notes that he has worked and developed the theory by himself, thus showing his talent for independent work. He is covering large areas of differential geometry, Cartan geometry, representation theory of Lie groups and Lie algebras, analysis of operator algebras, invariant differential operators, mathematical physics, and index theory.

In conclusion, I think Dr. Krysl has demonstrated a high level of innovation and quality of his research, and his achievements place him internationally among the best for his age group in his research area. Thus I recommend him for the appointment as associate professor.

Regards,



Bent Ørsted
Professor