<u>Abstracts</u>

(These are pages added to an older document appended at the end.)

In [24] we associate (subsec.1.10) a Cantor dynamical system to a non-properly ordered Bratteli diagram. In other words, we are able to define dynamics without the assumption of unique maximal path and unique minimal path. If one had a Bratteli diagram with, say 2 max paths and 2 min paths, one can, of course, define the usual Vershik transformation on the path space, except the two max paths. The issue of whether this map extends continuously seems a very subtle issue. Generically, one should expect that it does not. But it is easy to get examples where it does: just begin with a Cantor minimal system and choose KR partitions where the tops shrink to two points. Naturally our model is not the infinite path space, but it reduces to it in the properly ordered case. Since Bratteli diagrams with group actions rarely have unique maximal and minimal paths, until now there was no dynamics associated to them. Since this is no more a hurdle, in subsection 2.1 we construct skew-product dynamical systems associated to finite group valued edge labellings. The success of the Bratteli-Vershik model as originally envisaged (in the *properly ordered* case) was basically that, first, the space X could be seen as the path space of the diagram while the orbit relation appeared as cofinality (almost). Secondly, the $K-$theory invariant could be read off the diagram in the usual way. While neither of these is strictly true for our models here (except in the case it reduces to the old one), Ian Putnam and Christian Skau have pointed out that it does not seem to be far from being true and feel that sorting out the exact sense of this could be quite interesting. We thank them for this observation and for the encouraging letter to us wherein they noted that the construction of a dynamical system without the usual assumption of unique maximal and minimal path resolves many long-standing issues. In separate work the authors have resolved the $K-$theory aspect.

For a write-up on the results of [25] please see the referee's report on that article which has been included seperately.

In [23] we define a product for harmonic spinors on reductive homogeneous spaces. We give also some examples where harmonic spinors with coefficients in a module are expressed as a linear combination of products of harmonic spinors with coefficients in two other modules. One such example involves discrete series representations. 'Harmonic spinors', requiring only a spin structure rather than a complex structure, has long been regarded as a substitute for holomorphic forms. Since the product of holomorphic forms (whenever it makes sense) is holomorphic, it is then natural to consider a 'multiplication' for harmonic spinors. Our first result provides various instances of such a phenomenon in the context of Kostant's cubic Dirac operators for general connected reductive Lie groups. Even though the Borel-Weil-Bott Theorem, along with its non-compact analogues and spinor analogues, realizes representations as harmonic spinors, it is better to have a mechanism where this picture can be viewed coherently when the representation parameters change in a coherent way. The results of [23] opens up such a possibility.

It is an important question to understand how the Dirac cohomologies of representations in a coherent family are related. For example it could allow computation of Dirac cohomology of nonunitary representations in cases where some members of the coherent family are unitary and have known Dirac cohomology. The result of [26] is a partial result for an interesting special case, the cohomologically induced representations.

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PUBLICATIONS

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[6] A generalization of the Enright-Varadarajan modules, *Compositio Math.* 36 (1978) **PDF**

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[19] Colouring Quasi-Crystals with prescribed symmetries and frequencies, (with A. El Kacimi),*Discrete Comput. Geom.* 22 (1999),459-475. **PDF**

[20] Trace Splittings in C^*-algebras of Tiling Systems via Colourings (with A. El Kacimi), *Proceedings of the American Mathematical Society* 131 (2003),1191-1204. **Proc. AMS, vol.131 PDF PostScript**

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[22] Quantum Analogues of discrete series at roots of one, *Proceedings of an International Conference on "Harmonic Analysis and Quantum Groups", January 3-8,2005, Cochin University of Science and Technology, Kochi.* **PDF**

[23] A Product for Harmonic Spinors on reductive homogeneous spaces, (with S. Mehdi), **Journal of Lie Theory Vol.18(2008) PDF**

[24] Skew-product for group valued edge labellings of Bratteli diagrams, (with A. El Kacimi),*Preprint.* **PDF**

[25] The K-group of substitutional systems, (with A. El Kacimi), *Preprint.* **PDF**

[26] Representation theoretic harmonic spinors, (with Salah Mehdi), *Preprint, To appear in the Platinum Jubilee Special Issue of Indian Journal of Pure and Applied Mathematics.* **PDF**