Operators and Matrices
Volume 14, Number 2 (2020), 469–490 doi:10.7153/oam-2020-14-34

# ON NONCOMMUTATIVE JOININGS III

Jon P. Bannon, Jan Cameron and Kunal Mukherjee

*Abstract.* This paper is a continuation of our investigation on noncommutative joinings, containing a study of disjointness of induced representations, topology on the space of noncommutative (relative) joinings, a semitopological semigroup structure on (relative) self-joinings, and new examples.

*Mathematics subject classification* (2010): 46L55, 37A55.
*Keywords and phrases*: Von Neumann Algebras, ergodic theory, joinings.

## REFERENCES

[1] L. Accardi and C. Cecchini, *Conditional expectations in von Neumann algebras and a theorem of Takesaki*, J. Funct. Anal., 45 (1982), 245–273.
[2] J. Bannon, J. Cameron and K. Mukherjee, *On Noncommutative Joinings*, Int. Math. Res. Not. (IMRN), 15, (2018), 4734–4779.
[3] J. Bannon, J. Cameron and K. Mukherjee, *Noncommutative Joinings II*, arXiv:1905.06725, 2019.
[4] J. Bannon, J. Cameron and K. Mukherjee, *The Modular Symmetry of Markov Maps*, J. Math. Anal. Appl., 439 no 2, (2016), 449–936.
[5] B. Bekka, P. de la Harpe and A. Valette, *Kazhdan's Property (T)*, Cambridge University Press, Springer–Verlag, (2008).
[6] J. F. Berglund and K. H. Hofmann, *Compact Semitopological Semigroups and Weakly Almost Periodic Functions*, Lecture Notes in Mathematics, Springer–Verlag, (1967).
[7] M. D. Choi, *A Schwarz inequality for positive linear maps on $C^*$-algebras*, Illinois J. Math., 18, (1974), 565–574.
[8] T. Falcone, *$L^2$-von Neumann modules, their relative tensor products and the spatial derivative*, Illinois J. Math., 44 no. 2, (2000) 407–437.
[9] E. Glasner, *Ergodic theory via joinings*, Mathematical Surveys and Monographs 101, American Mathematical Society, Providence, RI, 2003.
[10] L. Gyongyosi and S. Imre, *Properties of the Quantum Channel*, arXiv:1208.1270, (2012).
[11] R. Høegh–Krohn, M. B. Landstad and E. Størmer, *Compact ergodic groups of automorphisms*, Ann. of Math. (2), 114(1), (1981), 75–86.
[12] M. Izumi, *Non-commutative Poisson boundaries and compact quantum group actions*, Adv. Math., 169 no. 1, (2002), 1–57.
[13] M. Lemańczyk, F. Parreau and J. P. Thouvenot, *Gaussian automorphisms whose ergodic self–joinings are Gaussian*, Fund. Math., 164, (2000), 253–293.
[14] K. Mukherjee and I. Patri, *Automorphisms of Compact Quantum Groups*, Proc. Lond. Math. Soc. (3), 116, (2017), 330–377.
[15] D. Newton and W. Parry, *On a factor automorphism of normal dynamical system*, Ann. Math. Statist., 37, (1966), 1528–1533.
[16] V. Paulsen, *Completely Bounded Maps and Operator Algebras*, Cambridge University Press, 2003.
[17] V. A. Rokhlin and Y. Sinai, *Constructions and properties of invariant measureable partitions*, Dokl. Akad. Nauk. SSSR,. 141, (1966), 1038–1041.
[18] J. L. Sauvageot and J. P. Thouvenot, *Une nouvelle définition de l'entropie dynamique des systèmes non commutatifs*, Comm. Math. Phys., 145, (1992), 411–423.


Paper OaM-14-34

[19] M. TAKESAKI, *Conditional expectations in von Neumann algebras*, J. Funct. Anal., 9, (1972), 306–321.
[20] M. TAKESAKI, *Theory of Operator Algebras II*, v.125 of Encylopedia of Mathematical Sciences. Springer–Verlag, Berlin, (2003).
[21] J. TOMIYAMA, *On the Projection of Norm One in $W^*$ algebras*, Proc. Japan Acad., 33(10), (1957), 608–612.
[22] S. ŞTRĂTILĂ, *Modular Theory in Operator Algebras*, Tonbridge Walls: Abacus Press; Bucharest: Editura Academiei, (1981).
[23] S. ŞTRĂTILĂ AND L. ZSIDÓ, *Lectures on von Neumann algebras*, Revision of the 1975 original, Translated from the Romanian by Silviu Teleman., Editura Academiei, Bucharest; Abacus Press, Tunbridge Wells, (1979).