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**Noise of Quantum Channels can Generate Quantum Entanglement from Classical Correlation**<sup>1</sup> LASZLO GYONGYOSI, Budapest University of Technology and Economics, Hungarian Academy of Sciences, SANDOR IMRE, Budapest University of Technology and Economics — Transmission of quantum entanglement will play a crucial role in future networks and long-distance quantum communications. Quantum Key Distribution, the working mechanism of quantum repeaters and the various quantum communication protocols are all based on quantum entanglement. To share entanglement between distant points, high fidelity quantum channels are needed. In practice, these communication links are noisy, which makes it impossible or extremely difficult and expensive to distribute entanglement. In this work we first show that quantum entanglement can be generated by a fundamentally new idea, exploiting the most natural effect of the communication channels: the noise itself of the link. We prove that the noise transformation of communication links that are not able to transmit quantum entanglement can be used to generate entanglement from classically correlated, unentangled input. We call this new phenomenon the Correlation Conversion property (CC-property) of communication channels. Our results have serious implications and fundamental consequences for the future of quantum communications, and for the development of global-scale quantum communication networks.

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