**Cellular noise of butterfly wing scales as a potential true random  number generator**

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In this paper, we study possibilities to exploit biological variability on a cellular level (cellular noise)[1] as a potential source of true random numbers.

Here we show that the Butterfly wing scales are an excellent model system for studying cellular noise due to their durability and availability in nature [2]. They are nano-patterned, biophotonic, particles (NBP), producing randomly distributed interference and diffraction effects.

We performed structural characterization of Butterfly wing scales using SEM. Optical microscopy is used to determine their randomized local spectra, diffraction pattern, and nonlinear optical response.

Colorimetric image processing techniques are used for to analyze optical pattern. Variation in color intensities is a consequence of cellular noise and interaction of light with NBPs. The pattern is randomly distributed along a growth axis of a wing scale.

Images obtained by optical microscopy are analyzed pixel distance intensity values are binarized and represented in a form of binary arrays.

Binary arrays are tested as a random number generator using the NIST suite [2]. The first estimate shows that it is most likely a random process, which has the potential to be used as a true random number generator.

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