

Monochiralities Caused by Sexuality

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It is shown how the interaction of sexuality and chirality causes monochiralities of the biosphere.

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In [1], Rikken and Raupach say: "We show experimentally that magnetochiral anisotropy can give rise to an enantiometric excess in a photochemical reaction driven by unpolarized light in a parallel magnetic field, which suggests that this effect may have played a role in the origin of the homochirality of life."* Also the fact that outside the tropics the sun goes always to the right (left) on the northern (southern) hemisphere suggests that this effect may, via the sun-dependent growth of organisms, have played a role in the origin of the homochirality of life.

Such effects which imply that the speed of the monochiralisation is proportional to the mole fraction of the not yet monochiralised organisms, lead very slowly to monochirality.

In [2] it was shown that the interplay of sexuality and chirality implies that the probability that a male and

female organism with the rare chirality are fruitful is proportional to the *square* of their small mole fraction. This leads much faster to monochirality:

If in an isolated population there are male and female organisms which mate regardless of whether their chiralities are equal or not, and whose copulations are only fruitful if their chiralities are equal, then the organisms with the less abundant chirality will finally die out because their copulations are more often fruitless than the copulations of the organisms with the more abundant chirality.

Even if in an isolated population right and left handed organisms are equally abundant and external influences can be neglected, with equal probability one of the chiralities will become dominant because such a system is, as to the chiralities, in an unstable equilibrium.

If in the course of time such isolated monochiral populations of different chiralities mix, then again the chirality of the greater population will survive.

Since the "invention" of sexuality, in this way monochiralities on earth were created without the necessity of any external influences.

An example is given by the land snail *Partula suturalis* on the island Moorea near Tahiti [3], on which there exist snails of different monochiralities of their shells in different isolated valleys. If by the experimenters such different monochiral populations are mixed, the chirality of the greater population survives.

[1] G. L. J. A. Rikken and E. Raupach, *Nature* **405**, 932 (2000).

[2] A. Klemm, *Z. Naturforsch.* **40a**, 1231 (1985).

[3] cf. J. Murray and B. Clarke, *Proc. Roy. Soc. London* **B211**, 83 (1980).

* The homochirality of life consists of its various right and left monochiralities. The word chiral stems from the Greek word *χῆρ*, meaning hand.

