

THE PHILLOTAXIS DYNAMIC SYMMETRY

Oleg Bondar

State University "L'vivs'ka Politekhnikha"
Lviv, Ukraine

Discovery of the fact of Minkowski geometry realization (the geometry of the space-time special relativity theory) in the phyllotaxis growth mechanism [1] made it possible to build a principally new mathematical theory of this phenomenon. In particular, it became possible to explain in terms of the new theory two different versions of the phyllotaxis dynamic symmetry (changes in the phyllotaxis symmetry) which are realized in nature: the dense inflorescence and collective fruit phyllotaxis, and the sprout phyllotaxis on tree branches or plant shoots.

These two versions are modeled by author using two different types of the so-called minimal surfaces – *cathenoid* and *helicoid* – which are closely interconnected and actually are the space modifications of Minkowski plane. In the first case, which corresponds to the dense inflorescence and collective fruit phyllotaxis, the reproduced grating is characterized by the radially-oriented π -multiple compression, and in the second case, by the π -multiple extension directed along the grating axis.

A noteworthy property of both models is the change correlation of angular α and linear distances ρ between the grating nodes: $\alpha \sim \rho$. In both cases the growing process and grating structure parameters are described in terms of the so-called golden hyperbolic functions (Gch, Gsh) which are based on the golden section Φ .

References

1. Bodnar, Oleg Ya. "The Phyllotaxis Geometry." *Dopovidi Akademiji Nauk Ukrajinjy* , no. 9 (1992), pp. 9-14 (in Ukrainian).