11th Conference on Dynamical Systems Applied
to Biology and Natural Sciences DSABNS 2020
Trento, Italy, February 4-7, 2020

BEHAVIOUR INDUCED PHASE TRANSITIONS IN EPIDEMIOLOGY OF INFECTIOUS DISEASES

Alberto d'Onofrio

International Prevention Research Institute, Lyon (France)

alberto.donofrio@i-pri.org

Phenomena concerning the spread and control of infectious diseases (IDs) can be read, from theoretical physics viewpoint, as phase changes and phase transitions (PTs). This is an increasingly important concept in Mathematical Epidemiology (ME) [2]. It is enough to think that the kinetic of PTs as well as the spatial progression of an epidemics are characterized by traveling waves (TWs) [1]. TWs are so intimately connected to the epidemiology of IDs that an epidemic TW was described in the IV–the century B.C by the greek historian Thucydides.
Nowadays it is increasingly understood that models of ME must include human behaviour [3], a major factor impacting on the spread, prevention and control of IDs.
In this talk we will illustrate by means of two case studies how human behaviour can induce phase transitions that can deeply impact on the spread, control and prevention of infectious diseases.

References

[1] Albano, A.M., Abraham, N.B, Chyba, D.E & M Martelli. (1984) *Bifurcations, propagating solutions, and phase transitions in a nonlinear chemical reaction with diffusion.* American Journal of Physics 52(2):161–167.

[2] Stollenwerk, N. & Jansen, V. (2011) *Population Biology and Criticality: From critical birth-death processes to self-organized criticality in mutation pathogen system* World Scientific.

[3] Manfredi, P., & d'Onofrio, A. (2013) *Modeling the Interplay Between Human Behavior and the Spread of Infectious Diseases*. Springer, New York.

 ISBN: 978-989-98750-7-4