

Mechanistic Perspective of Cancer Genesis and Progression in Era of Large Data

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There has been a tremendous progress in cancer research. However, it appears the current dominant cancer research framework of regarding cancer as diseases of genome leads impasse. Mechanistic side of biological processes seems not emphasized in current data analysis. Naturally questions have been asked that whether it is possible to develop alternative frameworks such that they can connect both to mutations and other genetic/genomic effects and to environmental factors. Furthermore, such framework can be made quantitative and with predictions experimentally testable. In this talk, I will present a positive answer to this calling. I will explain on our construction of endogenous network theory based on molecular-cellular agencies as dynamical variable. Such cancer theory explicitly demonstrates a profound connection to many fundamental concepts in physics, as such stochastic non-equilibrium processes, “energy” landscape, metastability, etc. It suggests that beneath cancer’s daunting complexity may lie a simplicity that gives grounds for hope. The rationales behind such theory, its predictions, and its initial experimental verifications will be presented. I hope to present the view that statistical/computer science analysis and mechanistic modeling are two sides of the systems biology.

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