# On Behavior Epidemic

Overview and notes of interesting articles

*Epstein\_2008* ‘‘The plague was nothing; fear of the plague was much more formidable.’’ Henri Poincare  
In classical epidemiology people do not endogenously engage, for example, in social distancing (protective sequestration) based on disease prevalence. Rather, they simply continue mixing (often uniformly) as if no epidemic were under way. This may be a reasonable assumption for non-lethal infections. Economists have begun to address this issue, introducing the notion of prevalence elastic behavior into epidemic models. Predictably, economic epidemiology, as this subfield is called, posits optimizing behavior on

the part of individuals. A term used for the resulting dynamics is rational epidemics.  
However, prevalence is treated as a kind of exogenous signal to which agents respond with some elasticity. They do not interact directly with one another to gain information on prevalence or in deciding how to behave.

We do not purport to define the term ‘‘fear.’’ Readers should feel free to interpret it as ‘‘concerned awareness,’’ for example.

The point is that we are modeling a behavior-inducing transmissible signal distinct from the pathogen itself. For expository purposes, ‘‘fear’’ will do. For those interested in the substantial literature on emotional contagions generally, see [5].

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Descrizione generata automaticamenteReview Wang\_2015

Modello per stato M 🡺 Misra\_2010

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**Coevolution of Pathogens and Cultural Practices: A New**

**Look at Behavioral Heterogeneity in Epidemics 🡺 Tanaka\_2000**

Consider a host population subdivided into two groups corresponding to two alternative forms of a behavioral trait that affects the rate of disease transmission. We label the two states ‘‘careful’’ (c) and ‘‘risky’’ (r): Individuals are either susceptible or infected. Individuals come into contact with each other in pairs at a rate proportional to the densities of each type in the pair, and a contact parameter. If the individuals are of the same cultural type, this parameter is y1; otherwise, the parameter is y2: Let bij represent the probability that the disease is transmitted from an infected individual in state j to a susceptible individual in state i; given a contact. We assume that these parameters are ordered as follows: brr > (bcr; brc) > bcc: The disease transmission coefficients are then y1bii and y2bij; where i,j = c,r

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Descrizione generata automaticamenteThe product of the 2 coefficients is indicated with.

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Descrizione generata automaticamenteThe system equations are:

**Beyond collective intelligence: Collective  
adaptation 🡺 Galesic\_2023**

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Descrizione generata automaticamenteHuman life is universally structured by assortment into collectives—groupings of various sizes and permanence, from small groups and teams to large organizations and communities [1]. Collectives shape and are shaped by individual cognitions, patterns of interactions, and the problem structures they encounter and create [2]. The rapidly increasing scale and complexity of our collectives potentially magnifies threats to our societies which are difficult to understand and predict [3], including the spread of conspiracy theories [4], denial of facts [5,6], extreme polarization [7] and violent extremism [8].  
Here we argue that, to understand these phenomena and contribute to their solutions, social scientists must better understand the way we collectively adapt to our changing world. We define this collective adaptation as dynamic interactions of social integration strategies, social environments and problem structures in complex socio-cognitive systems.

**Social learning**. Humans and other animals often learn from others [38–40]. This can be a less costly way than asocial learning to acquire valuable information about good solutions to a variety of tasks, from finding food and mates to solving complex technological and social problems. Many of the strategies described in the social learning literature have also been described in the literatures on collective problem-solving and group decision-making [39–41].

**Belief dynamics**. Diverse disciplines have been studying beliefs change over time and on social networks, developing a number of analytic and computational models of belief dynamics [85–90]. These models can help understand why in certain societies new beliefs - such as opinions on climate change or vaccines—spread more quickly than in others, sometimes leading to polarization and other times to consensus, and occasionally leading to backlash effects.

**Group decision-making**. This broad field at the intersection of psychology, management and applied mathematics [54] has contributed a vast array of theories and findings on interacting groups, from research on group decision-making algorithms [55–58] to the value of exchange of information [59]. Group decision-making has also been extensively studied in biology [60]

**Group minds**. Not only do we process information in groups, but the group itself is a rich information processing system that is often much greater than the sum of its parts [82]. For example, work on transactive memory looks at how information is stored within and flows between different members of the group, enhancing the amount of information the group can store and leverage in complex problem-solving tasks [83,84].

**Frequency-dependent social integration strategies.** Many disciplines have studied frequency-dependent social integration strategies over the last few centuries, or example, ‘complex contagion’  
models that are rightfully suggested as more appropriate than ‘simple contagion’ in many situations can be viewed as frequency-dependent rules that have been studied in other disciplines under different names [120].

**Network effects.** Parallel efforts in different disciplines can also contribute innovative new insights. For example, social network structures and their implications for individual and collective outcomes have been studied in sociology and social psychology for a long time. With the increased ease of measuring and modelling various phenomena on social networks, researchers from other disciplines such as statistical physics and computer science made a number of additional contributions, revisiting biases due to homophily such as false consensus [133,134], describing novel implications of the friendship paradox [135,136], and extending work on small worlds and degrees of separation [137,138].