

Complexity and Possible Emerging Intelligence in Bacterial Collectives

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Commentary

Bacteria are often described as unicellular organisms, but they are often found in the wild and in the laboratory in highly organized structures containing a large number of cells. These include macro-colonies and biofilms that can display highly complex structures (Ben-Jacob et al. 2998, Serra et al. 2013).

The complex structures within colonies or biofilms can display increased level of functional complexity and exhibit hints of functional differentiation (Serra et al. 2013). This is made possible by interactions that can include biochemical and ionic exchanges, suggesting similarities with the information processing ability of higher organisms. It should thus not be far-fetched to image a bacterial collective that is interacting and processing information in a way that is reminiscent of brain-like activity. In fact, complex and dynamical biochemical exchanges have been demonstrated to occur in bacterial communities. Moreover, ion channel signaling activities were also recently shown to lead to electrical bursts, within bacterial biofilms, that may be reminiscent of those occurring in the brain (Prindle et al, 2015).

Demonstrating some form of biological mentality or intelligence in bacteria is neither obvious nor unimaginable. But given the similarities that

exist in highly organized networks of interacting cells, whether they be bacterial collectives or more complex biological structures such as brains, it is possible to imagine that there might be processes that are highly reminiscent of mentality-like properties. As others have proposed, it seems as though microorganisms, through the complex interactions within their biomolecular networks, perform information processing and display higher-level functions such as memory, learning, anticipation, decision making, and adaptation that are hallmarks of intelligent systems (Westerhoff et al, 2014).

Whether these complex dynamical processes, happening in simpler organisms or in brains rely simply on ordinary biochemical exchanges or on less trivial or even yet to be characterized processes is definitely something worth investigating further (Robert, 2012).

References

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