The evolution of joint action: from quorum sensing to prospective coordination

Joint activities come in all shapes and sizes: bacterial colonies collectively emit light, chimpanzees use gestural signals to initiate and regulate grooming sessions, and humans act together in line dancing, masses, and barbecues. All these joint activities require their participants to solve coordination problems, which are ubiquitous in human society and throughout nature. Some coordination problems are simple and the procedures for dealing with them are fairly straightforward; others are highly demanding and solved in ways that are, as yet, poorly understood. Bioluminescence is in the first category; barbecuing in the second.

In order to get a handle on this variety, I propose to home in on the *correlation devices* that enable coordinated action. Correlation devices are circumstances external to the interaction as such that participants conditionalise their actions on, knowingly or unknowingly (Vanderschraaf 1995, Brandenburger and Friedenberg 2008). I briefly discuss two examples, quorum sensing and signalling, followed by a more leisurely discussion of a recent development: commitment making.

Quorum sensing

Quorum sensing is a comparatively simple case. In bioluminescent bacteria, light emission is coordinated by reference to the density levels of the "signalling molecules" secreted by the bacteria (Verma and Miyashiro 2013). These density levels serve as the bacteria's correlation devices, which enable them to light up in unison when population density reaches a threshold.

Although quorum sensing is often treated as cell-to-cell signalling, the so-called "signalling molecules" secreted by individual bacteria are not signals in the canonical sense. It is the *density* of signalling molecules that serves as a correlation device. Individual secretions impact density levels, but are not themselves correlation devices.

Signalling

In a standard signalling system of the kind invented by Lewis (1969), signals are correlation devices. Signalling systems have evolved many times and in

many species, including chimpanzees, who use gestures to coordinate joint activities such as grooming, play, and sex. Most of the gesture types used by chimpanzees have multiple functions and therefore depend on the context for their interpretation (Graham and Hobaiter 2025). Therefore, gesture types serve as higher-order correlation devices that help their users to disambiguate token gestures, which then serve as first-order correlation devices.

Commitments

It is a distinctive feature of joint action in our species is that we use language to coordinate our activities prospectively, and not just in the moment. Early in March, Betty and Barney agree to spend the first week of May in Sicily. In order to achieve their agreement, they engage in a communicative exchange, which is a joint activity in its own right, that results in a shared commitment to a joint activity in May. This shared commitment also entails that Betty and Barney have to coordinate their actions in the intervening period by agreeing on a travel plan, booking flights, and so on (Geurts 2019, 2022).

Prospective coordination is a recent development and it is a *sine qua non* for modern human culture and society. It began with the practice of treating each other as having commitments: normative relations between promisers and promisees, for example, which are negotiated in communicative exchanges. Commitments are correlation devices that, created by communicating in the present, enable us to coordinate our future activities over prolonged periods of time.

Discussion

Viewing joint action in terms of the correlation devices involved, the following conclusions may be drawn. At a general level, it is evident that, over time, agents acquired more control over their correlation devices. Although bioluminescent bacteria impact the density levels of signalling molecules, no single bacterium controls that parameter. By contrast, chimpanzees use gestural signals deliberately and strategically and the same goes for humans who use linguistic signals for commitment making. Second, and relatedly, both chimpanzees and humans employ signalling conventions as higher-order correlation devices, for which there is no evidence in bacteria. Third, we use communication to negotiate commitments: correlation devices of unprecedented power that enable us to flexibly coordinate our activities over large stretches of time.

References

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