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Perig Pitrou

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Opening image

“A mimetic storm.” Food offerings are placed on a ritual table during the *ch’a’cháak* ceremony, in which the participants solicit the intervention of the *báalam cháak*, entities associated with the rain, though a performance in which rain is imitated by a man pouring water from a gourd and a wooden machete is used to evoke thunder.

Model made by the Museo de antropología de Mexico on the basis of descriptions by Redfield and Villa Rojas. Image © P. Pitrou

The conclusion to this issue proposes that we understand the “imitation of the living” as a circular process connecting the observation of living beings to biomimetic action or construction (Provost, Kamili & Pitrou 2020). The logic of mimesis introduces a separation between the model that is imitated and its copy, but imitation can also be

understood to create a relation between humans and non-human living beings, as well as between the humans who engage in imitation. Biomimicry is thus more than an analytic operation that divides up organisms and environments in order to artificially reproduce elements of them; it is a process of assemblage that produces a synthesis between various kinds of facts (natural, technical, social).

- 1 In the case of body techniques, imitation aids in connecting biological dynamics to the social order through “physio-psycho-sociological assemblages of series of actions” (Mauss 1973 [1935]: 85; see also Karsenti 1998). In the rites described by Marcel Mauss, the imitation of animals proves that, beyond playing a social function in transmitting traditions, body techniques can serve to give non-human living beings a role in the construction of individual and collective identities. Humans are capable of imitating living beings because, as living beings themselves, they are capable of imitation.¹ The biomimetic practices involved in domesticating living beings and fabricating artifacts do not merely consist in duplicating natural phenomena, but in reshaping relations with the environment, which is why biomimicry has been presented as a new ecological paradigm (Pitrou, Dalsuet & Hurand 2016). André Leroi-Gourhan (1993 [1970]) explains how the *externalization* of biological functions in techniques allows humans to deeply transform their milieus. But what is the role of less centrifugal biomimetic processes within this dynamic of anthropization? Indeed, body techniques, biomimetic artifacts, and bio-inspired interventions in a milieu imply a form of *internalization* that is achieved through the observation of living beings and their environments.
- 2 This question is particularly complex for anthropology, which takes into account the range of social purposes (ritual, technical, ludic, artistic) biomimicry may serve. The role of imitation in coordinating human actions and structuring societies is well known (Hocart 1954; Taussig 1993). Without naturalizing these practices, as Gabriel Tarde does in *The Laws of Imitation* (2013 [1895]) and Roger Caillois does in *Le mimétisme animal* (1963), the anthropology of life and the anthropology of techniques provide methods (Pitrou 2014; 2017; 2019) for jointly examining the imitation of natural phenomena and its effects on the construction of collectives. The arrangement of three orders of facts—biological, technical, social—can be seen as a *systematization*. By using this term, I do not mean to claim that there is an equivalence or homogeneity between living systems and technical systems, something implicit in discourses on biomimicry. My intention, rather, is to examine assemblages that have dissimilar, heterogeneous levels of organization. Instead of claiming that systems are complete or closed—characteristics associated with the notion of system—my goal is to understand how imitation participates in the integration of various sub-systems, each with its own logic. I therefore propose studying biomimicry as a socio-technical system that establishes interactions with natural ecosystems via the mediation of imitation—that is, as a particular kind of imbrication of vital and technical processes (Akrich 1989; Pitrou, Coupaye & Provost 2016).
- 3 Emphasizing the eco-systemic dimension of life helps make clear the meaning of the “bio-” in biomimicry, for biomimicry consists both in imitating certain characteristic traits of organisms and in reproducing ecological relations. Thus, in biomimicry, it is a matter of both perceiving bodies through the senses and having an intellectual understanding of a set of relations, processes, and cycles that organize interactions between living beings and milieus. Examples such as making a garden that replicates how a non-human entity organizes the forest (Descola 2016), cultivating a plot of land

by imitating natural rhythms (Moreau, this issue), or building a closed artificial system such as the Biosphere 2, attest to the capacity to imitate not only *living beings*, but *life*, understood as a system of relations. This distinction, however, is merely conceptual, for imitating a living being always supposes—even if only implicitly—situating an organism or its artifactual reproduction within a milieu (Provost, Kamili, Pitrou, this issue). For example, the morphology of an ant or a lobster—and of the robots that imitate them—always reflect the limitations imposed upon these beings by the milieus in which they move about.

- 4 In his book *System: The Shaping of Modern Knowledge*, Clifford Siskin (2016) explains how the modern West shifted from a paradigm in which the goal was to create “systems of the world” to one in which reality is seen as a “world of systems.” In the 20th century, cybernetics embodied this effort to bring together various systems—in particular, living and technical systems. Norbert Wiener (1961), for example, studied how artificial objects can replicate fundamental traits of life (self-organization, homeostasis, information processing, feedback, learning). Regardless of the accuracy of this analogy between living and technical systems, the significance of cybernetics is that it raises theoretical and technical issues posed by the integration of sub-systems. By taking a cybernetic or computational point of view, social anthropology can use this type of integrative approach in order to focus on how the interaction between living and technical systems fits into social organizations, and to examine the question of human control. Drawing on the work of Gregory Bateson, Roy Rappaport (1979) identifies homeostatic functions affecting ecological equilibriums and interhuman conflict dynamics in pig sacrifices in Papua New Guinea. Similarly, by envisioning navigation crews on ships as cognitive and computational systems, Edwin Hutchins (1995) approaches cognition as a process that gives order to natural phenomena and coordinates human activities. As Valerie Olson (2018) explains with regard to spaceships, understood as artificial ecosystems, the goal here is to understand how humans can be embedded participants in the systems of relations that they create.
- 5 With biomimicry, the more specific issue is to determine the role imitation plays among various processes for objectivating ecological and social relationships (myths, rites, visual representations, tools for measuring and observing, know-how, mathematization, etc.) Aldo Leopold (1949) recommended “thinking like a mountain” to imagine the links between beings in a biome. We may then ask: how does biomimicry make it possible to act like a mountain—that is, to imitate life understood as an ecosystem? How does this technical activity connect to the systems of relations that govern the organization of collectives? I will outline several directions we may take to begin answering these questions by examining the objectivation of life in what Émile Durkheim calls “mimetic rites.”

Mimetic rites as a systematization of life

In *The Elementary Forms of Religious Life*, Durkheim explains that mimetic rites “are composed of movements and cries intended to mimic the behavior or traits of the animal whose reproduction is hoped for” (Durkheim 1995 [1912]: 355. This simple definition corresponds to complex practices. During an initiation rite, change is staged by imitating a *process* of natural transformation. Drawing on descriptions found in *The Native Tribes of Central Australia* (Spencer & Gillen 1898), Durkheim discusses the

Intichiuma rite performed by the Witchetty Grub clan of the Arunta, which involves building “a shelter out of long, narrow branches; it is called the Umbana and represents the chrysalis from which the insect emerges” (Durkheim 1995 [1912]: 355). Participants enter this structure by crawling on the ground, and then come out imitating the movements of a butterfly. These (mimetic) body techniques thus represent a *moment* within a sequence that establishes analogies between cycles of biological transformation and the construction of totemic clans. Another rite reproduces eco-systemic relations even more fully:

The participants in the rite adorn themselves with designs representing the unchalka bush, on which this grub lives at the beginning of its life; then they cover a shield with concentric circles of down that represent another kind of bush on which the adult insect lays its eggs. When these preparations are complete, everyone sits on the ground in a semicircle facing the principal celebrant. The celebrant alternately curves his body in two by bending toward the ground and rising on his knees; at the same time, he shakes his outspread arms, a way of representing the wings of the insect. From time to time, he leans over the shield, imitating the manner in which the butterfly hovers over the shrubs in which it lays its eggs. When this ceremony is over, another begins at a different place, to which they go in silence. This time, two shields are used. On one, the tracks of the grub are represented by zigzag lines; on the other are concentric circles of unequal size, some representing the eggs of the insect and the others the seeds of the eremophile bush, on which it feeds. As in the first ceremony, everyone sits in silence while the celebrant moves about, imitating the movements of the animal when it leaves the chrysalis and struggles to take flight. (Ibid: 356).

- 6 Imitating animals means selecting and reshaping sense perceptions on the basis of socially determined motivations. Durkheim shows how stylized, schematic bodily movements are combined with heterogeneous elements (ethological observations, diagrams, performances) in order to objectivate cycles and relations. Thus, the richness of the semiotic repertory and the plasticity of the body are used to imitate life through sophisticated ritual montages. On the subject of another rite, Durkheim writes, “Living beings are not the only ones they try to imitate. In a large number of tribes, the Intichiuma of the Rain basically consists of imitative rites” (Ibid.: 357). Among the Urabunna, the head of the clan decorates himself in white down, which he shakes into the air to represent clouds: “In that way, he imitates the great Alcheringa man-clouds that, according to legend, had the habit of rising to the sky to form the clouds from which the rain then came back to earth. In short, the object of the entire rite is to depict the formation and ascent of the rain-bearing clouds” (Ibid.: 358). When Arthur M. Hocart turned to studying mimetic rites several years after Durkheim, he proposed distinguishing them from “cosmic” rites, in which “true imitation is no longer the central part of the ritual, but rather the perception of analogies is” (Hocart 1954). He identifies the pragmatic effects of this practice of crafting a system on the basis of analogies: “mere resemblance is not sufficient to establish a bond; the devisers of the rite set out to create a bond that was not there” (Hocart 1954). Without necessarily distinguishing two types of rites, we may understand imitation as a continuum along which diverse operations—more or less corporal, more or less objectified—are carried out, and which goes far beyond simple repetitive mimicking of another body. Artifacts are not the only things that materialize the complexity of systems: movements are sometimes “re-semanticized” to become instruments that embody eco-systemic dynamics, as we see in the analogy between the rain and the movement of shaking off the white down to spread it across the sky.

A ritual to imitate life understood as an activity of distribution

Mimetic rites act on both social and natural systems. In Mesoamerica, Robert Redfield and Alfonso Villa Rojas (1962 [1934]) describe the “mimetic storms” that the Yucatan Maya create during agricultural rites by pouring water out of a gourd and shaking a machete whose blade is considered analogous to lightning (**opening image, illustration 1**). Multi-modal ritual actions (prayers, movements, and artifacts) cause a miniature ecosystem to emerge. In order to describe in greater detail how this type of rite, which is quite common in Mesoamerica and the Andes (Pitrou 2016b), unfolds, I will analyze material I have gathered over the course of ethnographic studies I have carried out in Mexico since 2005. I spent two years in the Mixe Sierra for my doctoral research, and since 2010 I have made yearly trips to the state of Oaxaca to study theories of life among Amerindian populations there.

- 7 In my work on Mixe village communities—the Mixe are an ethnolinguistic group made up of around 130,000 speakers of Mixe, a language belonging to the Mixe-Zoque family—I interpret farmers’ ceremonial deposits as miniature devices that imitate life (Pitrou 2016). It is for this reason that, in my article “Figuration des processus vitaux et co-activité dans la Sierra Mixe de Oaxaca (Mexique)” (Pitrou 2012), I use the concept of biomimicry in relation to these ritual processes, which seek to co-ordinate human and non-human cycles and agencies. I will briefly restate my conclusions from that analysis here.
- 8 Corn cultivation requires familiarity with organisms and their milieu; this is what makes it possible to decide, on the basis of altitudinal zonation, which type of corn to plant and when. Knowing how to co-ordinate human actions is also crucial to the operation: in the village of Tlahuitoltepec, planters move across a field in a line, dropping five corn kernels and three beans into seed holes made with digging sticks. In this context, it is clear that counting techniques are at the heart of ritual *dispositifs* (calendars, ceremonial deposits), which solicit the agency of powers of nature (water, sun, earth). Within a regime of “co-activity,” ritual actions imitate the intervention of these non-human agents: the ordered distribution of material elements (corn powder, balls of corn dough) on a miniature surface is intended to bring about the participation of non-human entities. Some prayers ask the Earth, which is referred to using the doublet “The Expanse, the Surface of the Earth,” to make the corn to grow, while others ask “He, Who Makes Being Alive” (*yikjujyky’äjtpi*, *yik-* causative, *jujyky’ajt* “being alive”, -*pi* personifier) to distribute rain; the ritual gestures of distribution thus initiate a “mimetic appeal.” Humans do more than imitate a program of actions to be performed at a macroscopic scale: from an overhead position, they take a point of view similar to that of a being who distributes the rain. Just as in Durkheim’s example, the imitation of life is part of a framework for organizing collective work within a collaboration that combines human and non-human efforts.

The variables of a system: body, resemblance, control

Mimetic rites are not only of interest to the anthropology of religion, for they belong to the “science of the concrete” (Lévi-Strauss 1966 [1962]) and raise fundamental

questions for the anthropology of life. I will formulate three such questions here, regarding the place of the body, resemblance, and human control respectively, in order to point to some paths to take in approaching biomimicry as a system.

- 9 It would be a good idea to compile a grammar of actions in order to identify uses of the body within biomimetic techniques. There is no evidence that some hypothetical progress of the human mind leads from observing an organism to understanding ecosystems, nor that building artifacts necessarily involves more abstract ideas than body techniques do. Biomimetic techniques can be co-present with one other, synchronously comprising a range of ways to objectivate the manifestation of life at various levels. It is only with difficulty that imitation of the visible characteristics of living beings can be separated from the intellectual effort to conceive of life as a system.
- 10 It is also not clear that the emergence of abstract *dispositifs* means moving away from resemblance. Figuration and abstraction (geometrical or arithmetic abstraction) often constitute two options available to a society for exploring the real. In Mesoamerica, ritual miniaturization is based on figurative reproduction (of animals, plants, and fields), as well as on counting operations using elements with low iconic value (balls of corn dough, corn flour, cacao beans). In the naturalist West, life may be modelled without concern for visual resemblance—as in the reproduction of micro-environments at the Île-de-France Écotron—or artificial ecosystems such as Biosphere 2 may combine the mathematization of ecosystems with the reproduction of prototypical landscapes (see illustration 1).



1. Reproduction of an ocean in Biosphere 2, the largest closed artificial ecosystem in the world

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- 11 The place of humans within biomimetic systems remains to be examined. In his article “Paysages bioculturels et biomimétisme à un niveau écosystémique,” Doyle McKey (2016) highlights the similarities between natural morphologies and human-made artificial systems; for example, the similarities between the morphology of “tiger brush,” which ensures optimal water distribution, and the Zaï system in which farmers plant their crops following a similar pattern. The question then arises of the degree of

intentionality involved in these practices. To shed light on these problems, it is important to go beyond a dualist approach that asks whether humans imitate nature or not and to reflect on the relations of co-determination that exist between ecosystems and technical systems. Philippe Descola (2016) demonstrates that the “forest gardens” of the Achuar do not merely imitate the forest: they must be interpreted on the basis of a whole set of relations—mythical, ritual, and symbolic—that are established between the gardeners and the forest masters who are said, at their own level, to take care of forest gardens.

- 12 Even if a biomimetic process is not fully formalized in a technical project, its intelligibility depends on its socio-technical and ontological context. Far from being universal, imitation takes on distinct meanings within different collectivities. It would be interesting, within a comparative framework (Descola 2013), to catalogue the various objectives of imitation (construction of the person, productive activities, legitimizing power, and so on) in order to identify the major relational patterns actualized by the imitation of life. The variety of social institutions associated with biomimicry leads to resituating Western biomimetic practices within a broader framework. Even within the Western world, biomimicry is associated with very different projects, ranging from “reconnecting” to natural milieus to the Promethean hope of artificially reproducing living beings and environments. To grasp this complexity, the anthropology of life, which systematically analyzes the correlations between theories of life and socio-technical contexts, constitutes an indispensable approach. While biomimetic discourses claim that humans must observe nature in order to imitate it, it is equally if not more fruitful to seek to understand how humans conceive of nature and life when they engage in this type of process.

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NOTES

1. This has been confirmed by research in ethology (Hurley & Chater 2005) and on mirror neurons (Rizzolatti & Sinigaglia 2008).

ABSTRACTS

Biomimicry does more than copy natural beings and processes: it allows humans to establish relationships with them for various social purposes. It is thus important that social anthropology view biomimicry as an activity connecting various levels of organization (biological, technical, social). This article analyzes biomimicry as a *system* that develops through the quest to artificially imitate ecosystems. In order to distinguish the principal techniques involved in this form of objectivation, I propose an analysis of “mimetic rites.”

Le biomimétisme fait plus que copier des êtres et des processus naturels : il permet aux humains d'instaurer une relation avec eux, en fonction de diverses finalités sociales. Pour l'anthropologie sociale, il se révèle pertinent de l'envisager comme une activité qui articule différents niveaux d'organisation (biologique, technique, social). Cet article propose donc d'analyser le biomimétisme comme un *système* qui se développe en cherchant à imiter artificiellement des écosystèmes. Afin d'identifier les principales techniques à l'œuvre dans cette objectivation de la vie et les êtres vivants, une analyse des « rites mimétiques » est proposée.

INDEX

Mots-clés: anthropologie de la vie, systèmes, cybernétique, modélisation des systèmes vivants, biomimétisme, rites mimétiques

Keywords: anthropology of life, systems, cybernetics, modeling of living, biomimicry, mimetic rituals

AUTHORS

PERIG PITROU

Perig Pitrou is a director of research at the CNRS, where he leads the “Anthropology of Life” team within the Collège de France’s Social Anthropology Laboratory. He does ethnographic fieldwork among Amerindian populations in Oaxaca (Mexico) and in scientific laboratories in the West, focusing on theories of life associated with biotechnologies.