

Playing with ants & other insects

A phenomenological approach of ant mimicry in relation to games and culture

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Keywords

Ants, mimicry, cybernetics, games, masks, role play, paidia, phenomenology, post-humanism.

Abstract

This is an interdisciplinary research that explores the potential aspect ants and other insects have in relation to mimicry in games and culture, building on post-human approaches that arise predominantly from the discourses of Roger Caillois and Jakob von Uexküll. By combining biological mimicry with a phenomenological discourse about games, I will connect ants' behavior with emergent manifestations and to the wearing of masks in humans. Ants are team players, whose collective strength and ecological domination is based on self-organization, cooperation and being a model organization for other species. It will be demonstrated that the ant colony has been a successful evolutionary model mimicked by solitary insects as well as by technology, particularly for the design of non-player characters and dynamic game simulations.

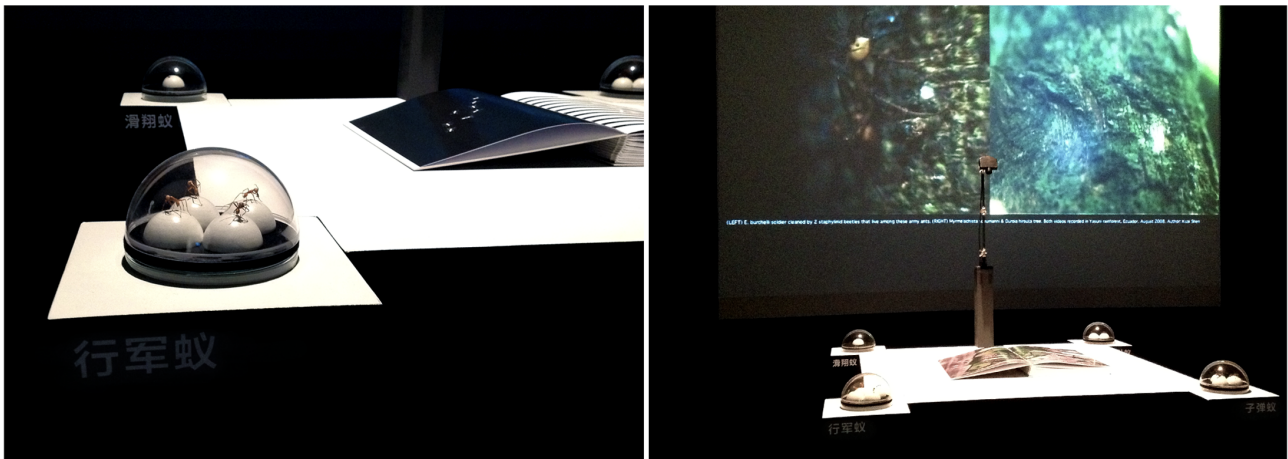
Consequently, the fundamentals of my approach are: a) socialization is part of play and play is part of socialization; b) the core of role-playing games is to explore sociality in disguise in imaginary worlds that can be designed by rules and limitations, but which could also emerge by means of self-organization; c) mimicry, anarchic forms of play and emergence are natural manifestations of living systems, which are also found in technological systems.

Heading: Introduction

The interest of this research is to reveal the interrelation between complex systems in insect societies and those game systems designed by humans. It is essential, to investigate the existing parallels in the decision-making process of living organisms, humans and artificial agents when it comes to achievement, competition and collaboration.

Special attention is focused on ants' communication and social behaviour as a form of emergent game play within the context of social evolution, which can be juxtaposed and related to the constantly changing audiovisual milieu of humans. The technological network, as emphasized by Jussi Parikka, can be perceived as a manifestation of non-human forces. [1] These share common properties with the self-organization of some insect populations, particularly ants. From this, I infer that the emergence of resilient networks in nature, as in the case of the ant colony by means of feedback loops, resembles decentralized technological networks, particularly bottom-up networks of the Internet. [2]

Therefore, the intention to focus primarily on ants is fair and simple: the contemplation of the complex life of ants has inspired humans in many ways to create models to optimize the flow of traffic, find the shortest and most energy efficient travel route, simulate the decentralization of information, model the mechanics behind swarms, create self-organized artificial agents and learn the power of relationships in the formation of intelligent networks. Thus, networks, specially community-driven networks in and around games are a determinant force for the future of video game culture: the emergence of a super-organization of anonymous players. Concerning the evolution of social behavior, ants represent a natural superorganism, a collective force that is self-organized and anonymous which can serve as a model to design new forms of game play.



Caption: Figure 1 - *Playing with ants & other insects*, installation by Kuai Shen, November 2012. Exhibition at the Museum of Science and Technology in Beijing, China, as part of the 3rd Art and Science International Exhibition And Symposium organized by Tsinghua University. Photography by the author. © Kuai Shen, 2012. Used with permission.

Insects incontestably play an important role in the creation of new ecosystems and the transformations of old ones. Indeed, ants and other insects share the same environment with us, whether we like it or not. It is important to recognize those solitary species that mimic the ants and live with them as a representation of what technology does for us. They participate, thus, in the construction and mutation of a post human ecology, whose future lies in the transdisciplinary communication forms between the artefact and the organic.

Therefore, this thesis will serve as a manifesto to encourage interest and expand the portals of perception in order to relate insects to video games and inspire in future generations the creation of games not for humans, but for insects. Ecology and technology could be reunited including interspecific interactions and emergent forms of play that challenge classic storytelling and conventional game rules, but most of all that can present a critical discourse of the human player as the controller of experiences.

Subheading: About Caillois' *Paidia* and Uexküll's *Umwelt*

In order to embrace the context of this research, the reader will have to submit to a particular theoretical framework, which focuses on the ontology of play as a key for social learning in other living species of this planet. The question 'can ants and other insects play games?' will be discoursed upon the forms of play classified by Roger Caillois: anarchic

game play or *paidia* and *mimicry*. Nevertheless, I will also include emergent forms of play. Still, my essay will strongly refer Caillois' work, but it will also be shaped by the works of Jakob von Uexküll on insect perception and biosemiotics, as well as other approaches on post-humanism, cybernetic ecologies and new materialism.

Caillois defined two manifestations of play in humans which I will use throughout my dissertation. The first one is *paidia* which means to play without rules, also addressed as anarchic game play. [3] The second is *mimicry* which describes the experience of assuming other roles while playing a temporary game of make-believe. [4] Furthermore, Caillois appointed *ludus* as the act of playing by the rules which I consider relevant when analyzing the experience of assuming other identities in virtual social environments, like in role-playing games and multi-player fantasy games. [5] By these means, the intention is to revitalize Caillois' identification of mimicry and paidia as indispensable in order to perceive insects as agents of affection, which can be related to the act of play concerning transformation rituals. To this extent, mimicry will be discussed as a system where one subject assumes another identity to deceive another subject or to achieve a goal in a temporary realm of make-believe.

It is important to acknowledge that role-playing games provide experiences; they become alive in the mind because of the rich decisions made by the interrelated players, an action which requires a certain level of intersubjectivity. Particularly, intersubjectivity seems essential to understand the concept of interspecies and the wearing of masks in humans. It is also important to indicate that games nowadays are increasingly becoming more socially than individually challenging. Therefore, ants' complex social organization represents a fascinating research subject which needs to be examined in order to challenge conventions and raise awareness to the meaning of what is to control an experience.

	AGÔN (competition)	ALEA (chance)	MIMICRY (simulation)	ILINX (vertigo)
PAIDIA Tumult Agitation Immoderate laughter Fun	not regulated or spontaneous contests and sport competitions among friends	rhymes, heads or tails, some card games	children's initiations, games of illusion, tag, masks, disguises	children whirling swinging, dancing (party context)
↑ ↓				
Patience Concentration Talent Strategy LUDUS	boxing, football, chess or any institutionalized contest and sports in general	lottery casino games slot machines bets	theater, acting, circus	tightrope walking skiing, mountain climbing (inside competition)

* video games are not included in this table

Caption: Figure 2 - The *paidia* and *ludus* of Caillois. Every vertical column shows examples of the 4 main classifications of play identified by Caillois, where the correspondent forms of play, paidia and ludus, are shown as opposites. Graphic designed by the author based on the original classifications in *Man, Play and Games* by Roger Caillois, 1961, page 36. © Kuai Shen, 2012. Used with permission.

Furthermore, the initial admiration for ants' self-organization becomes a phenomenon to

scrutinize under the third order of cybernetics: how we as observers are affected by the unfolding events of what seems to be a manifestation of a social nature we can understand. There is a certain level of human intersubjectivity when we observe ants. This means a faculty to perceive and relate to the other which integrates, invades or perturbs my territory, my space of action. This is what constitutes Jakob Von Uexküll's main topic of post-human research in relation to my research.

Uexküll addressed the different perceptual universes in other animals, suggesting different realities for each individual. His concept of 'Umwelt' represents the recognition of organismic perceptions, communication channels and adaptable behaviours as part of the purpose and sensations of a nature that is not limited to human beings; Uexküll accounted the inner experience of living beings other than humans in relation to the local cause and effect taking place in a determined environment as a consequence of the individual's formative perception, which acts upon the environment as well as upon the subjects themselves. [6] Living systems as complex as the ants transform matter and process information, leaving an effect mark on natural habitats that affect the individuals in the colony as well as other species in the surroundings. [7]

The exceptionally malleable and curious character of ants presents behaviors common to us humans. The world of ants is rich in interspecies-interactions and is full of unexpected events, competition, guests and parasites, which serve as a metaphor to the systematics of the games we play. Both species act as hosts adopting or displacing guests depending on the profits of an initiated relationship. This recognition will be explored by referring the theoretical frameworks of Caillois and Uexküll to reveal the common forces at play in the world of humans and ants.

Subheading: The 3 portals into the techno-culture of ants

The social life of insects, specially of ants, has been an inspiration and role model for humankind over centuries. [8] Ants have impacted human perceptions since the very start of the empirical observation and recording of exotic nature in the rainforests of the new world tropics. [9] We have to recognize ants have a close relation with humans, specially considering the very essence of efficient labor. In this regard, the myrmecologists Hölldobler & Wilson explain, "ants illustrate how the division of labor can be crafted with flexible behavior programs to achieve an optimal efficiency of a working group." [10] Furthermore, they state, "their networks of cooperating individuals have suggested new designs in computers and shed light on how neurons of the brain might interact in the creation of mind." [11]

Certainly, we can enlarge the chronological impact of ants on science and realize they have regularly served as models for technology. Continually we are programming algorithms into non-player characters, digital simulations and swarming phenomena. The cellular automata, the ant colony optimization programs, general game playing are deeply integrated in the digital simulations and video games we play to the extent we do not notice them anymore. They have become to my opinion insect avatars, i. e., manifestations of non-human forces in the technological topologies. [12] Thus, that complexity between the nature of ants and role playing games of humans is concealed; it has to be revealed by crossing symbolic portals.

Therefore, the concept of the insect avatar here symbolizes the human quest to transform that reality. It represents the wearing of masks to transcend the ordinary. [13] In this context, the mimicry as a form of play expressed by Roger Caillois deals with the

concealing and the camouflage, which relates to the metamorphosis and adaptation of insects to their surroundings. By controlling avatars in video games, players can explore new roles and experience emotional levels of interaction with strangers. Hence, we can experience that phenomenology by crossing the 3 portals to reveal the cultural, scientific and natural impact of ants in our playful visionary society: *the alien portal*, *the network portal* and *the material portal*.

Heading: The alien portal

The human mind has seen in ants something oddly similar to us, yet bizarre and irrational to our comprehension. If we start by defining the physical appearance of an ant, we immediately realize how strange they are to us: exterior exoskeleton, six legs, two antennae, razor-sharp mandibles, diverse glands to produce pheromones and a painful sting that can produce a 24-hour fever effect in humans, as is the case of *Paraponera clavata*, or giant bullet ant. The bullet ant is the star of the sci-fi film *Empire of the ants*, a b-horror movie from the late seventies depicting giant ants that kill humans. In fact, the film is a slandered version of the original short story by H.G. Wells, which demonstrates the use of ants as aliens in science fiction. [14] The plot of the original story narrates the conflicts of an English colony trying to control an ant plague in a remote location of the Brazilian rainforests, a metaphor of the historical events that actually occurred during the imperial colonization. [15]



Caption: Figure 3 - *Paraponera clavata*, Kuai Shen, January 2013. Photograph taken by the author in the Yasuní near the research station of the *Pontificia Universidad Católica del Ecuador*. © Kuai Shen, 2013. Used with permission.

The most widespread convention and reigning misconception about ants and other insects is that they are pests, invaders of our homes and even invaders of our sanity. In general,

the human is perplexed and finds difficult to acknowledge ants as social beings. Six legs and two antennae are morphological characteristics of insects but provocatively repulsive to more than a few humans. This terrifying image has earned the ants the title of aliens with superior collective intelligence in another cult film, *Phase IV*. Moreover, they even became the secret power source of one forgotten Marvel super-hero, *The Ant-Man*, who is able to transform into different sizes denoting ants' capacity of exponential growth to become more than one. The anthropological connotations that arise when we confront ants are reasserted by Charlotte Sleight in her analysis about the impact of ants:

[BLOCK QUOTE BEGINS] There was a trend towards representing ants as increasingly alien in the first half of the twentieth century. Today we remain torn between an admiration for their ways and an anxiety that their lack of individuality parodies our own helplessness in society. [16]

[BLOCK QUOTE ENDS]

To this extent, the word alien refers to all forms of invasion which transgress human autonomy and ridicule our efficiency of central organization. Insects have always managed to amaze and scare humans. The confrontation of the unknown has always awakened a strange attraction and curiosity for scrutinization and description of that which is new and distinct. However, we need to avoid anthropomorphisms and concentrate on the fact that ants do not need to acquire human size in order to really disturb our habitats and contest our domination of the planet. Today the world's greatest invasion extending thousands of kilometers is that of *Linepithema humile*, the Argentine ant in the Mediterranean coast. [17] Likewise, the invasion of the fire ants, *Solenopsis invicta*, which have conquered United States and Australia, requires millions of dollars a year in extermination methods and pesticides. [18]

Hence, tropical insects that manage to invade and infest other ecologies are regarded as misfits and represent to the common people vectors for disease transmission. Throughout history humans have been battling against insects in hope to exterminate them completely. As suggested by Sleight, insects like the *Tsetse* fly, bearer of the sleeping disease, the *Anopheles* or *Aedes* mosquitos, carriers of Malaria and Yellow Fever, and the infamous *Xenopsylla cheopsis* flea, responsible for the Black Death in the 14th century, were all terrible enemies of any colonization campaign and human settlement. [19] Even today in our post-biological times they pose a lessened threat, somewhat contained but still a considerable and uncontrollable threat.

Yet again Sleight indicates that it was not only flies and fleas, but the army ants who marched in front of the impotent gaze of the dying and the sick as a demonstration of the indomitable power of tropical nature:

[BLOCK QUOTE BEGINS] Thus ants were constructed as a projection of fears clustered around colonial themes. The sheer numbers of insects appalled the white man; they created in him a sense of being overwhelmed, connecting with his sense of isolation amongst his other-coloured human neighbors. [20]

[BLOCK QUOTE ENDS]

Human creativity has been inspired by the conflict with insects and we have fantasized with the creation of alien forms that could bizarrely haunt our imagination serving as opponents that perpetually invoke fear and rejection. This is demonstrated by the role ants and other insects have played in the form of avatars and digital representations in video games.

Subheading: The role of ants and other insects in video games

During the last four decades in the history of video games enemies inspired by insect forms have been playing the roles of the invaders and aliens which the human heroes must destroy and repel. Although the appearance of insect enemies in games has been irregular, they have been misfiring and dodging all the bullets from the players. Insects have become the disruptors of our goal-driven creations. Even nowadays the term *bug* is an official computer jargon and the verb *debugging* is synonymous of getting rid of the virtual malfunctions in our code. The assessment of a bug inside the computer becomes a symbol of transgression and invasion of property, as reported by Admiral Grace Murray Hopper in *The First Bug*:

[BLOCK QUOTE BEGINS]

In the summer of 1945 we were building Mark II [...] We were working in a World War I temporary building [on the campus of Harvard University]. It was a hot summer and there was no air-conditioning, so all the windows were open. Mark II stopped, and we were trying to get her going. We finally found the relay that had failed. Inside the relay was a moth that had been beaten to death by the relay. [21]

[BLOCK QUOTE ENDS]

Indeed, insects have been used as symbols of invasion and alienation. They became ideal avatars for the forces of evil which have to be defeated. This disdain of confronting insects as enemies is based on the fact that our human instincts tell us that the creatures which seem and act strange cannot be friendly. We tend to develop a sense of repulsion to those creatures we do not understand. Yet, by shooting bugs in the computer we neglect completely the original vitality and nature of the insect.

However, in relation to the concept of the alien portal it is relevant to present an exclusive selection of those games where insects have achieved prominence in the history of video games:

1. *Centipede*, 1981: a classic arcade game of the eighties where an evil carnivorous arthropod together with the flea, the spider and the scorpion, want to eat the player in a dimension full of mushrooms. Designer Dona Bailey recalls in an interview: "If the multi-segmented insect is the bad thing and the player is at the bottom, you kind of have to shoot, but it didn't seem that bad to shoot a bug." [22]
2. *Ant Attack*, 1983: created by Sandy White it was one of the first survival horror games that enabled the player to select either a male or female character. The goal of the game was basically to escape from giant ants in the city of *Antescher* and rescue your beloved one. Along with *Q*bert* and *Zaxxon* released the year before, *Ant Attack* became one of the first games to use isometric projection. [23]
3. *SimAnt*, 1991: Will Wright designed a simulation game about an ant colony of the common black ant that lives in the backyard and gardens of suburban houses. It was a natural derivation from Wright's previous iconic game, *SimCity*. This became the first computer game where ants were the main characters of a story and pheromone trails were used as a form of strategy against the enemy, which were the red ants. One interesting fact is that Wright got inspiration from the local interaction in the self-organizing ant colony to create *The Sims*. He explains in an interview:

[BLOCK QUOTE BEGINS]

The basic engine for The Sims really ends up being one of any pheromones. Every object in the environment is sending out an advertisement of pheromones in a particular flavor. The flavors are the eight basic needs of the Sims. So they can advertise food, energy, fun, social, hygiene. Every object is described in those terms, being the collection of pheromones that it broadcasts. [24]

[BLOCK QUOTE ENDS]

4. *The Zergs in StarCraft*, 1998-2012: The role of insects in *Starcraft* is not difficult to experience once you choose to play the *Zergs*. They are a race of highly evolved, genetically modified aliens with insect body and parasitical behaviour. They are characterized by being socially organized with the capacity to swarm, the faculty of spreading viruses and diseases as a deterrent form of defense and a caste system of reproduction relying on a queen that lay eggs. [25] Their resilient metabolism enabled *Zergs* to parasite other species merging with the new body and taking control over it; an analogous behaviour found in real endoparasites of Earth. For example, many *Eucharitid* parasitoid wasps oviposit eggs on plant material, once these hatched they attach to foraging ants of the genus *Wasmannia* or *Solenopsis* in order to enter their nests and feed from their larvae [26]; or the pathogenic parasitoid fungus, *Cordyceps unilateralis*, whose spores pierce the chitin body and slowly take control over the mechanic functions of the ant by spreading inside its brain and turning it into a zombie ant. [27]



Caption: Figure 4 - Zombie ant, Kuai Shen, January 2013. Photograph taken by the author in the Yasuní near the research station of the *Pontificia Universidad Católica del Ecuador*. © Kuai Shen, 2013. Used with permission.

Heading: The network portal (or the portal of relationships)

Ants' capacity to emerge as a greater organization by means of feedback mechanisms have served as a model for the scientific research of networks. Since the beginning of cybernetics, particularly through Norbert Wiener's mathematical study on the regulation and control of messages applied to machines and living systems, the study of the transmission of information has been related to the development and the functioning of networks and how these help institute organizations. Ant-world networks can indeed be used to model and predict the outcomes and changes in real-world networks. [28]

There has always been an interest in trying to relate and understand the intricacies, differences and analogies between social collectives in nature and those under human control. The organic expansion of the ant march looks from above like highways of information, trails that interconnect nodes which facilitate the transmission of messages. Ant's bottom-up organization has a transmediality aspect because it can be compared to the network of neurons in the brain and even to emergent networks in Internet. [29]

There seems to exist in the scientific community the incessant need to appoint universal rules that can be applied to replicate the complexity of nature. The result of applying ants as models for technologic efficiency in the world of humans is the widely propagated ant colony optimization algorithm or ACO. As Jussi Parikka sustains, the importance of modeling ants as optimization machines has to do with how nature already has solved our problems:

[BLOCK QUOTE BEGINS]

The adoption of ant and bees as problem-solving machines has been a key theme in information sciences since the early analysis of ant trails and bee hives around the 1950s. In recent years research into social insects (especially ants) as optimization machines has risen to be a whole research field of its own. Ant colony optimization algorithms have been used to find ideal ways of managing networks and other distributed systems [...] proving, it is claimed, nature's way of solving complex mathematical problems. [30]

[BLOCK QUOTE ENDS]

ACO is responsible for many human transactions in the technological world of today and it correlates to the formation of resilient networks that not only solve problems but also adapt to conflict situations. For instance, the swarming behavior of army ants that create the *bivouac* demonstrate that the strength of a network rests in the intensity of its interconnections. The bivouac depends on social cooperation to respond to perturbations of the environment; as a result of cooperation the ants achieve the formation of malleable networks capable of interaction with other matter.

The *bivouac* is actually a temporary living architecture made of the bodies of the neotropical *Eciton burchelli* ants of the Americas, a nomadic nest construction, which is built by means of self-organization: the ants interconnect themselves with their mandibles and legs creating an organic nest out of the millions of ants, which protects the queen and the larvae from danger. They create this flexible living architecture within niches in trees, between rotten logs or hollows on the forest soil. Any favorable ground dwelling can be used as a base to start the construction. Sites are scouted by ants who deposit attraction pheromones, which in turn are followed by more and more ants until the site with bigger conglomeration is favored over others. [31] The army ants do this over and over again while they migrate from one place to another in the rain forest.



Caption: Figure 5 - Bivouac, Kuai Shen, September 2008. Photograph taken by the author in the Yasuní near the research station of the *Pontificia Universidad Católica del Ecuador*. © Kuai Shen, 2013. Used with permission.

Additionally, raiding columns of *Eciton burchelli* have also served for the development of swarm simulations. Dr. Ian Couzin and his team at Princeton University came up with a predictive model that shows the instinct to swarm is a recurrent behaviour in humans, too. [32] Couzin states that there are two rules injected in the collective unconscious behaviour of a swarm that allows it to behave efficiently as an entity: “stay as close together with the group and move in the same direction.” [33] His results demonstrate how similar humans can be to ants in special contexts and how we can adapt such models to solve human world problems. Moreover, the 3-column raids of the ant swarm resemble the density of information flowing in the Internet nowadays.

The interest in ant networks brings the concept of swarming closer to social networks like Facebook. Biologist Noa Pinter-Wollman from a science research team at Stanford University corroborates the fact that ant networks use some workers as main hubs for the distribution of information; the results of her experiment were based on videotaped interactions of *Pogonomyrmex* harvester ants, where 90% of the ant traffic was making an average of 40 antennae contacts, while only 10% was making more than 100 contacts. [34] Pinter-Wollman states this pattern of interactions matches how humans share information on Facebook. [35] She explains that most users are connected to a relatively small number of friends, yet a handful of users have thousands of friends acting as information hubs. Another researcher, Melanie Moses from the University of New Mexico in Albuquerque, confirms this interrelation between online social networks and ants:

[BLOCK QUOTE BEGINS]

These results mirror what we know about human social contact and technological

networks, these ants are another empirical system we can look to for answers about how natural selection has been able to build these complex networks. [36]

[BLOCK QUOTE ENDS]

In conclusion, ants are an established utility for scientific research, whose research focus has shifted from individual competition to the studies of collective competition. The scientific interest for resilient networks in the post-biological era can be related to the increased attention of how natural systems affect each other and coevolve creating immunities and survive in extreme environments. With the complex application and understanding of networks, we went from a model of control of individuals to a model of prediction of massive crowds. The formation and behavior of the masses have been reduced nowadays to software simulations and algorithms in programs. These algorithms represent insects avatars, models of nature that help us predict the movements and directions of human-made networks. However, the scientific work with ants needs to be perceived as a form of phenomenological materiality, too, in which the observer and the observable are affected by a mutual process of recognition and identification. I will delve into this subject in the next section.

Heading: The material portal (or the portal of affects)

In terms of creating meaning out of the topologies and organic irregularities of nature, ants are the masters of material interaction. Ants are eco-engineers which create opportunities for others to join them and exchange resources. This contrasts with the human mastery in material manipulation, which usually means exploiting and extracting without contributing with the balance of nature. The material portal focuses on how ants affect our comprehension of reality, specially recurring to Uexküll's description of the distinctive perceptions of animals, a world of affects and variations like Parikka puts it: "What Uexküll implied was that we are dealing not with predetermined objects of nature but with subject-object relations that are defined by the potentiality in their encounters." [37]

Ants' sophisticated faculty to intermingle with others, to tolerate and form interspecific collectives, makes them ideal agents for modeling the complexity of conflict and competition in real world situations. Human's condescending observation of ants from above inevitably make us reflect on our own existence. We wonder about the meaning of self identity and individuality. Descriptions of their behavior have been compared to ours and been used as metaphors for ages. For example, the pioneer myrmecologist William Morton Wheeler knew about the multiple appealing nature of the ant:

[BLOCK QUOTE BEGINS]

I have endeavored to appeal to several classes of readers – to the general reader, who is always more or less interested in ants; to the zoologist, who cannot afford to ignore their polymorphism or their symbiotic and parasitic relationships; to the entomologist, who should study the ants if only for the purpose of modifying his views on the limits of genera and species, and to the comparative psychologist, who is sure to find in them the most intricate instincts and the closest approach to intelligence among invertebrate animals. [38]

[BLOCK QUOTE ENDS]

What we think is collective intelligence is in fact the result of eusociality and the power of affection. This is demonstrated by the leaf-cutter ants of the Attini tribe in the tropical rainforests of the Americas where they have nurtured a long-lasting symbiotic relationship by culturing fungus gardens of *Leucocoprinus gongylophorus*. [39] In exchange the fungus grows producing an organic shelter for the ants and nutritional food for their larvae. The

social instinct of ants shows us the importance of cooperation with other species in natural collectives. Such organizations become symbiotic and can be approached by what cybernetics calls feedback and control mechanisms.



Caption: Figure 6 - *The social fungus gardeners*, Kuai Shen, July 2013. Photograph of the top of the garden of *Leucocoprinus gongylophorus* with minors of *Atta cephalotes*, taken by the author in his studio. © Kuai Shen, 2013. Used with permission.

The ants play a very interesting game with their immediate environment; they are able to cooperate as long as the terms of correspondences are true; as long as the feedback mechanisms are exciting enough in order for a complementary network of interrelation to coexist. Symbiosis is a successful competitive form of mutualism in terms of ecosystem domination and this has been proven by the evolution of relationships between ants and plants: certain species of *Azteca* and *Psudeomyrmex* live in *Cecropia* trees and protect them from any predator establishing a successful resilient network of collaboration [40]; *Camponotus schmitzi* is an obligate inhabitant of the carnivorous pitcher plant *Nepenthes bicalcarata*, which the plant tolerates because the ants improve the abundance in nitrogen for the leaves and prevent nutrient loss to kleptoparasites, thus proving a nutritional mutualism between these two species. [41]

But probably the devil's garden created by the ant *Myrmelacista schumanni* is worth an examination due to the impact created in the human observer. For many local people in the rainforests of Ecuador and Peru, the *lemon ant*, is associated with the myth of the 'devil's garden'. They are given as delicacies to tourists because they do have an acid taste when eaten. However, the flavor of the lemon ant is deceiving as it is actually a specialized herbicide used to exterminate competitive plants growing around their host. Frederickson, Greene and Gordon documented this unique relationship:

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Devil's gardens are large stands of trees in the Amazonian rainforest that consist almost entirely of a single species, *Duroia hirsuta* and, according to local legend, are cultivated by an evil forest spirit. Here we show that the ant *Myrmelachista schumanni*, which nests in *D. hirsuta* stems, creates devil's gardens by poisoning all plants except its host plants with formic acid. By killing these other plants, *M. schumanni* provides its colonies with abundant nest sites — a long-lasting benefit as colonies can live for 800 years. [42]

[BLOCK QUOTE ENDS]

In conclusion, there are conditions and qualities of nature that ants are masters in coding and decoding. They possess another form of communication that challenges our human dependency on verbal language. This is what Uexküll's refers as the different perceptions of animals, the distinction of different levels of meaning. Uexküll's immanent recomposition of realities based on the point of view of the subject is important to understand intersubjectivity and affection: "The superiority of certain modeling tasks human beings have thanks to our neuron-packed cerebral cortices should not be confused with either a complete perspective or a lack of complex sensory processing in nonhuman beings." [43]

The journey into the three portals of the world of ants has granted us the vantage position we needed to discover what I called the multiplicity of the one: the process of becoming something else and the experience of being something else. We are ready to continue to the world of masks and mimicry.

Heading: A game of masks (Becoming) and a game of mimicry (Being)

Imagination is part of the unique repertoire of foresight we humans possess, that faculty to plan, quantify and be prepared for possible future outcomes. Imagination is a quality we cannot prove to exist in insects. Nevertheless, mimicry exhibits intrinsic characteristics linked to imagination because both require audacity. For example, *Ectatomma* ants can wear the mask of death, i.e., they play dead if they are in danger, so to deceive predators only to uncurl seconds later and run away. [44] This behavior has to do with the suspension of reality that a player experiences when controlling an avatar in a role playing game, as Caillois proposed, imagination in humans becomes invention in insects: "Mimicry is incessant invention. The rule of the game [...] consists in the actor's fascinating the spectator, while avoiding an error that might lead the spectator to break the spell." [45]

The reasons for humans to disguise and play games of make-believe, role-playing games, can be attributed to a desire to transform reality. Games could be regarded as irrational if we take into account that they allow us to escape from the rational world and its canonical regulations, specially from the social restraints of conventional identities; in irrationality we find the closest relation there can be to insects. It is the intensity of immersion in playing the new role you choose in a game that blurs the limitation of space in front of the computer, making gender division irrelevant and allowing freedom from social constraints. Role playing games constitute a magic realm where we forget about the male-female duality and become everything we cannot become in ordinary life. Following this line of thought, the process of becoming another is about assuming other identities by means of wearing masks.

The best example of the use of masks in video games is *The Legend of Zelda: Majora's Mask*, a Nintendo 64 game title of the nineties which became a cult well after its release. The main character, *Link*, has to collect 24 types of transformation masks to acquire special abilities, which enable the wielding of distinct weapons and the use of magic.

Majora's Mask demonstrates thus Caillois' mimicry play form. The player experiences the transformation into the races of the *Dekus*, Gorons and *Zoras*, opening different topologies of action with the same heroic character. [46] The game proves the existence of the mask as a portal of transformation, where the action of playing the game itself can be regarded as a ritual. Caillois elucidated that the true act of mimicry is a complimentary play form covering any immersive activity, by means of masks or travesty, "in which one participates and which stresses the very fact the whole play is masked or otherwise disguised only to promote the temporary pleasure in passing for another." [47]

Passing for another is of course a common phenomenon in insects. The metaphor of the mask in insects encompasses extensive examples. Yet, one of the most employed mechanism of camouflage in insects is ant mimicry, which belongs to the natural phenomenon of biological mimicry. Biological mimicry is a form of camouflage used by many insects and few other animals which exists at the molecular or organismic level; organismic mimicry may in turn exist at the individual and population levels. [48] Particularly the latter applies to ant mimicry which is an ecological set-up that includes two or more protagonists performing three roles: being a model, a mimic, or a victim of deception. [49] Thus, for me mimicry is the ability to get lost in the perception space of a victim of deception. Mimicry is the apprehension of the environment and the sense of being affected by it while creating an effect on it without being noticed.



Caption: Figure 7 - Wearing the mask of ants (Left: ant mimicking jumping spider / Right: army ant staphylinid). Both photographs were taken by the author; the left one was taken near Otongachi station in the Otonga reserve, Ecuador; the right one was taken in the Yasuní near the research station of the *Pontificia Universidad Católica del Ecuador*. © Kuai Shen, 2013. Used with permission.

Although a definite consensus on the advantages of ant mimicry by solitary insects has not been agreed by science yet, the benefits of ant mimicry according to my own observations are: ants are avoided because of their collective power to overcome single competitors; adult ants are unpalatable to many predators because they are composed of chemicals; ants are successful beings who can provide protection and food if you collaborate with them. This being said, many solitary insects have taken advantage of wearing the mask of ants to deceive and exploit, or scare away predators. Some of the most remarkable ant mimics are: nymphs of praying mantises behave and look like ants to escape predators; [50] spiders from the order *Salticidae*, also known as *ant mimicking jumping spiders*, are omnivore predators that prey on any insect including ants; [51] the *Acanthaspis petax* assassin bug covers itself with a mask made from carcasses of dead ants in order to escape predators; [52] parasitic beetles of the order *Staphylinidae* mimic form and

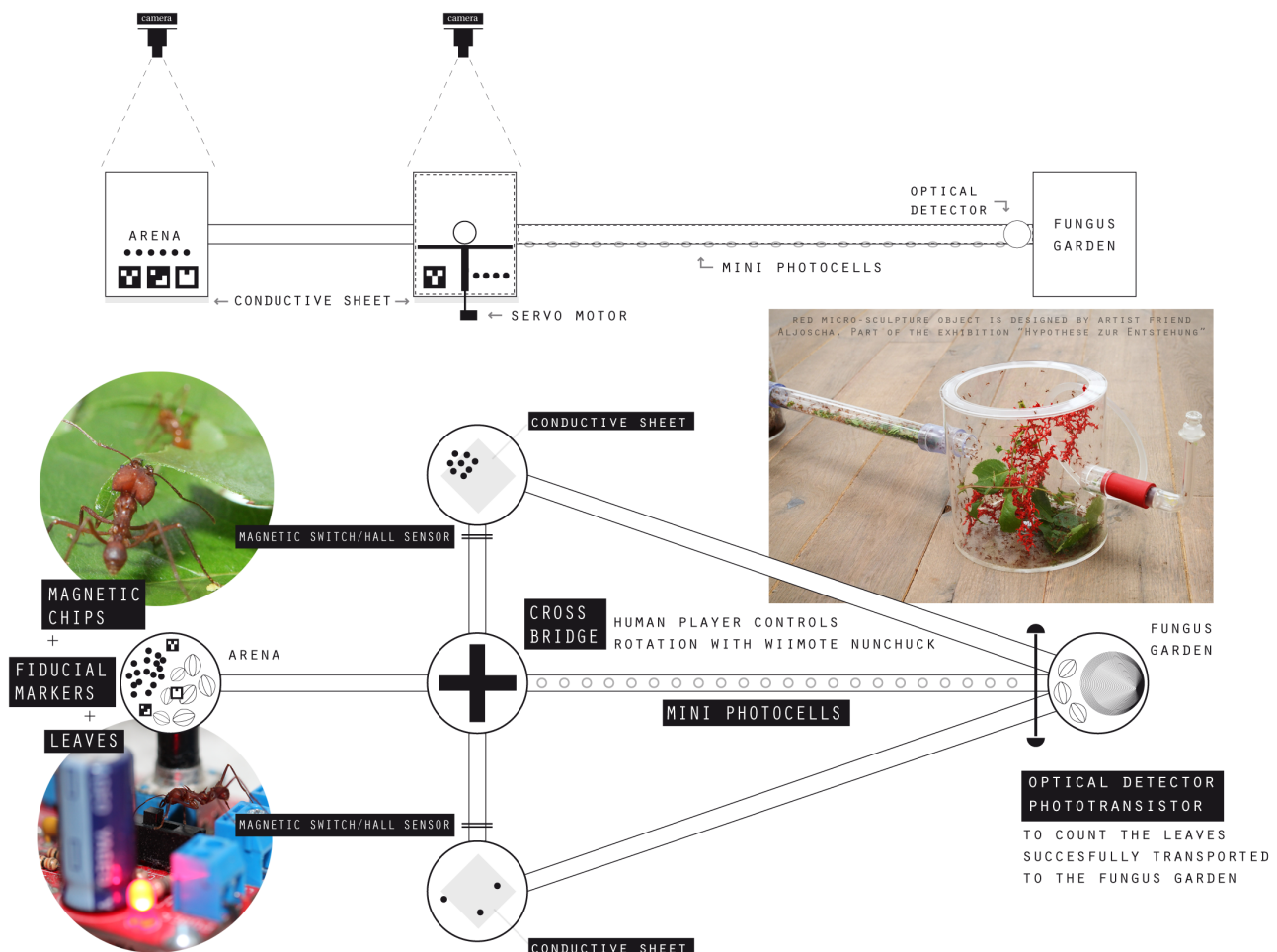
coloration of *Ecitonini* army ants to blend in the mighty swarm disappearing from the sight of predators (they even groom the ants and help them in raids); [53] caterpillars of the blue butterfly *Phengaris Alcon* mimic the stridulation of the *Myrmica* ants in order to get tended and fed by them; [54] *Ichneumon* wasps reproduce what is called 'propaganda pheromones' which confuse ants into fighting each other, enabling the wasp to sneak in the brood chamber to eat their larvae. [55]

Consequently, ants and their mimicking insects demonstrate they are playing a game for survival. From an interdisciplinary perspective, the faculty of some insects to map the space and embed themselves into it, becoming invisible and causing havoc to our human surroundings, is the result of a cybernetic adaptation of a non-human species to our technological systems. I believe Caillois idealized his classification of mimicry as a manifestation of play that can be valid for all living beings, based on this same potential of malleability and metamorphosis of insect populations. Therefore, metamorphosis and mimicry are biological transformations that of course have their systemic embodiments in the digital realm of computer games. To my opinion these systemic embodiments, the insect avatars, can bring humans closer to the understanding of the relation between the technological environment of humans and the intensities of becoming and being in the insect.

Heading: Conclusion (controlling space, playing against nature)

The game is in our mind. The beauty of the free and energetic activity of playing games resides on its openness for expression and its subjective impact on the imagination of the player. It transforms perceptions and confronts realities. We see and rely strongly on vision; thus we are creative visionaries. Insects, on the other hand, do not rely entirely on vision; they are natural sensors relying on chemicals and the modulation of behaviors and perceptions, what Uexküll called *Umwelt*. However, insects create and transform just like humans do, and therein lies the vivid proof connecting us with them. For humans the behaviors of insects could become symbols of both order and disorder, metaphors associated to the meaning of socialization and to the meaning of play. [56]

Clearly games represent a medium to confront reality. The focus of games should be how natural spaces and computer-generated spaces can become intertwined in the post-biological era; how technology and ecology can help understand and respect the formation of social and biological collective forces. Embracing knowledge about the interactions in the world of insects and the manifestations of play in humans could bring light to a different form of playing games, beyond visual stimulation and more into open spaces, encouraging the involvement of other senses where by means of technology and biological sensors we could form alliances to play harmoniously with nature, or maybe against it.



Caption: Figure 8 - A game to play with ants (prototype), Kuai Shen, 2012-2014. Concept for a game where sensors are integrated in a colony of leaf-cutter ants. The sensors provide information about labor activity to the player, who can open gates and influence the physical topology of the habitat in order to help the ants get to the food sources. Graphic designed by the author. © Kuai Shen, 2012. Used with permission.

While it is seemingly interesting to observe and identify the relations culture and technology share with insects, specifically the forces at play when an insect mimics another and when a human assumes another role in games, play in insects is not the same as it is for humans. Mimicry in insects is an organic experience of transformation where the individual lets go of itself and does not worry about control; it is a natural instinct. Therefore, a conflict arises between the intention in the games people play (the will to play a game and submit to the rules) and that sudden burst of energy in insects to survive, which is always present and inherent in their behavior whether they want to control it or not. The key association here is that *paidia*, that sudden burst of spontaneity and irrationality, exuberant and spontaneous, is found in insects too. *Paidia* has more to do with the metamorphosis and mimicry in insects than with the formality of rules in the games of humans.

We may argue at this point about the order of nature and the meaning of natural selection, the determination of genotypes and phenotypes, but the conclusion I am drawing here is based on the obsession we humans have with control. Between the human central mind and its interests there lies a conflict with the emergent natural events occurring outside technology. Yet, technology also has unforeseeable manifestations. This is what relates technology with the non-human forces of insects. Humans impose rules, destroy and

construct spaces; in the world we live today we are the rulers. Human design is a regulation of signs along a teleological path, towards an end that we previously defined. If rules and spaces are defined by humans, then these are the games insects can play. In fact, I come to the conclusion that ants and other insects have been playing an anarchic game. The world of humans is imposed and determined: top-down. The world of insects is free and versatile: bottom-up. Metaphorically speaking, insects have been playing against humans for a long time because we have destroyed and perturbed their habitats, still they have been playing against our rules manifesting a vitality which goes beyond our anthropocentric perceptions.

References and Notes

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- [2] The idea of comparing bottom-up internet structures and decentralized systems of information with ants derives principally from my experiences and visionary intention regarding my own artistic practice, coupled with the inspiration from readings of authors whose theoretical perspectives inspired potential paths of investigation. In this case see Steven Johnson, *Emergence: The connected lives of ants, brains, cities, and software* (New York: Simon & Schuster, 2002); additionally see Manuel De Landa, *Philosophy & Simulation: The Emergence of Synthetic Reason* (London: Continuum, 2011).
- [3] Roger Caillois, *Man, Play and Games* (Chicago: University of Illinois Press, 1961), 13.
- [4] Ibid., 20-21.
- [5] Ibid., 27.
- [6] Jakob Von Uexküll, *A Foray into the World of Animals and Humans* (Minneapolis: University of Minnesota Press, 2010), 69-71.
- [7] Ibid., 75.
- [8] Ants appear in the Bible and in the Coran as examples of hard work and altruism.
- [9] For instance, the illustrations of Joris Hoefnagel popularized insects in Europe during the late fifteenth century. See Janice Neri, *The Insect and the Image: Visualizing Nature in Early Modern Europe, 1500-1700* (Minneapolis: University of Minnesota Press, 2011), 3-6.
- [10] Bert Hölldobler and Edward O. Wilson, *The Superorganism: The Beauty, Elegance, and Strangeness of Insect Societies* (New York: W. W. Norton & Company, 2009), 18.
- [11] Ibid.
- [12] As defined in the Oxford Dictionaries, the noun avatāra is derived from the Sanskrit

‘descent’ or ‘to cross’; an incarnation, embodiment, or manifestation of a person or idea. See Oxford Dictionaries, s.v. “avatar,” accessed May 12, 2012, <http://www.oxforddictionaries.com/definition/english/avatar>.

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it.” See Jussi Parikka, *Insect Media: An Archeology of Animals and Technology*, 98.

Author Biography

Kuai Shen is an insect media artist and researcher from Ecuador. He holds a BA in digital arts from University San Francisco de Quito, an MA in media arts from the Academy of Media Arts Cologne, and an MA in Game Design and Development from the University of Applied Sciences Cologne. He has exhibited internationally at media art festivals, galleries and biennials in Germany, Belgium, England, Slovenia, Italy, Mexico, Canada and China, as well as participated in important European symposia. Kuai Shen has published his research with ants in a book entitled *Biologically-Inspired Computing for the Arts* from the University of Colorado and in the Leonardo MIT Journal for the Siggraph. His artistic approach to self-organization and emergence is envisioned in audiovisual installations that reflect on interspecies artistic collaboration with ants and the metaphor of a post-human ecology, an ecology whose future lies in the communication between species and the mutualism between technological media (human artifacts) and insect media (biological organisms). His current research focuses on ant mimicry in the post-biologic technology of humans based on phenomenology, resilient networks and mimicry. In 2013 he won the *Edith-Russ-Haus Medienkunstpreis* and received an honorary mention in hybrid art from the *Prix Ars Electronica*.