

Interview with Mitchell Joachim, Peder Anker and Nicholas Gervasi*

***Conducted and/or edited by the Volume Editors.**

Volume Editors: The unmatched influence that human societies are wielding on the natural world is a given based on changes in climate and the environment, also called the epoch of the Anthropocene. Do we need to investigate how that dominance changes the life of plants and animals in urban areas?

Mitchell Joachim, Peder Anker and Nicholas Gervasi: We tend to think of urbanization as a realm apart, somehow separate from the ecosystem, but nothing could be further from reality. We need to search below the urban veneer to reveal the teeming wildlife that symbiotically shares our streets and dwellings. Inside the built environment, there are wall-eating snails that are overrunning Miami, packs of wild boars that meander Berlin, and an uncontrollable monkey incursion of Cape Town. Not to mention the all-too-familiar sights of city pigeons, and large colonies of rats. From carpet-hungry insects to coyotes hanging out in food shops, we have discovered streets that are far more alive than we often comprehend.

That's right. With the changing conditions of the environment, animals too try to adapt, as in the case of wild polar bears entering streetscapes in Svalbard or brown bears searching for food in urban garbage dumps in Canada. This demonstrates to us how various species of animals are adjusting to city life and examines how human mindsets and society influence wildlife issues in metropolitan areas (Cronon 1997). The unmatched influence that human societies are wielding on the natural world is a given based on changes in climate and the environment, also called the epoch of the Anthropocene.

VEs: With human populations increasing, we're having a cumulative impact on global ecosystems. What do these impacts mean for our cities?

MJ, PA and NG: It's huge. Increasing human populations are having a cumulative impact on global ecosystems, and nowhere do these impacts overlay as much as they do in cities. The growth of cities all over the world over the last century has been exceptional, with no end in sight for when cities will stop mushrooming. The largest cities in the world have grown exponentially, with Shanghai, for example, increasing

in population from about six million in the early 1950s to twenty-four million today (National Bureau of Statistics of China 2011). The situation is similar in smaller cities, such as in the case of Accra, which, during the same time period, grew from about two hundred thousand to two and half million. This phenomenon is spurred by the general human population growth in the world from about 2.7 to 7.7 billion people from the early 1950s until today (United Nations 2019).

At the same time, human consumption has increased, not only as a result of population growth, but also per capita. With that comes stress on natural resources for the city, such as energy and drinking water, and the ever-increasing production of garbage.

VEs: What does this mean for our understanding of the city?

MJ, PA and NG: With radical city growth, the geographical meaning of what's urban needs to be reevaluated. Sticking to politically defined city boundaries, architectural ideas of densities or aesthetical notions of what looks urban, sub-urban or countryside may hinder a deeper understanding of the nature of a city (Forman 2016). Humans, animals, fish, insects, plants, seeds, and dead materials are consistently on the move. Humans are not the only ones arriving in cities as tourists or immigrants. Birds sitting on the roof of a skyscraper may be travelers from a different continent, and some new invasive algae in the harbor may have arrived with the ballast water from a boat traveling the seven seas.

Materials travel too. The steel for a building may have its origin in a far away steel mill, which got its energy from even further away in some hydroelectric dam in a different nation. Only a thorough understanding of how species and things move may open up sustainable policies and management of them. This movement, plus the associated spatial requirements, creates a view of a transformative human to animal landscape that operates in flux (Wilson 2017).

VEs: But materials can adapt more easily to new city environments than animals. Do we need a better understanding of how animals adapt?

MJ, PA and NG: For sure. With radical city growth, the wild natural creatures and plants that live side-by-side with us have been forced to adapt to a whole suite of perplexing conditions: they must survive in the city's hotter climate; they need to be able to endure either in the semidesert of the high, stony, and spacious structures we call buildings (known as the urban heat island effect) or in the pocket-like havens of municipal parks (which create their own hazards, including smog and free-ranging

pets); traffic causes incessant noise, a mist of superfine dust particles, and obstructions to movement for any animal that cannot fly or burrow; nutrition sources are chiefly human-derived. The wildlife sharing these spaces with us are not just surviving, but evolving ways of prospering. Some animals thrive while others suffer in urban conditions.

True! There are many examples of adaptation that uncover a spectacular vision of urban evolution in which humans and wildlife co-exist in an inimitable harmony. We can expose that evolution occurs far more rapidly than Darwin envisaged, while delivering a gleam of hope that our sprint towards rampant overpopulation might not take the rest of nature down with us. I have read about the co-evolution of carrion crows in the Japanese city of Sendai. They have adapted to use oncoming traffic to break nuts for food (Schilthuizen 2019).

And lizards in Puerto Rico are evolving feet that alter their grip on surfaces like concrete more successfully.

And did you know that Europe's inner-city blackbirds sing at a superior pitch than their rural counterparts, to be heard over the noise of traffic?

Not to mention the ability of a host of insects, such as ants, bugs, centipedes, cockroaches, fleas, lice, millipedes, mosquitoes, moths, and termites to adapt to human structures and their impressive ability to resist aggressive termination programs. I believe we need to investigate how that dominance is rapidly stretching over into the genes of most plants and animals especially in urban areas. In order to better understand the architectural response in the long term, studies on mitigation techniques and subsequent species populations are paramount.

Yes, human-induced rapid environmental change has led invasive and urbanized insects to adapt to the underground habitats created by subway and train excavation. A new branch of the mosquito population formed in the London Underground, adapting to feed on mammals, as they previously preferred birds. Although the types of mosquitos that transmit West Nile virus live above ground and typically seek birds to bite, there is a change, albeit rare and slim, that these mosquitos could breed with those who prefer feeding on mammals, to which humans could be targeted. Thus, our urban environment could potentially give rise to a distinct species of mosquitos that not only adapted an affinity for humans, but also infect us with disease.

VEs: How about species extinction? I'm sure there are plenty of animals that fail to adapt to the urban environments?

MJ, PA and NG: Sadly, that is true. Most animals fail to adapt to city environments. It is therefore of great importance to identify species that are at risk of population loss due to human activities. Species can range from impacted but not threatened all the way to near extinction. Many species may be under habitat stress though they are not on the Endangered Species List, such as honeybees, which are crucial to human food systems.

With threats looming from the linguistic to the biologic, what is most alarming about extinction is its rapid pace. Although it can occur naturally, humans have inextricably accelerated the scale and intensity of extinction events (Kolbert 2015). Anthropogenic actions have altered the planet's metabolism and stimulated feedback loops that exacerbate species loss. For example, development leads to habitat destruction, which in turns leads to space for more development subsequently creating more habitat destruction. By losing key ecosystem services, the momentum of extinction garners even more strength.

Scientists have shown in deductions made from the fossil record and geological evidence that disturbance events, such as asteroid or meteorite strikes (Figure A1), have subsequently led to mass extinctions. They have also shown that five of these disturbing periods have occurred, and we are currently in the sixth.

However, these unpredictable sublime phenomena are not the only causes of extinction. Humans have instigated their own catastrophic events, such as ethnic cleansings, blockades of immigration, obliteration of indigenous cultures, overzealous land development and economic suppression. These events have seriously diminished and outright eradicated unique elements of our collective culture. Each loss is an irrevocable change because potential breakthroughs and gains disappear.

True. Sustainability and extinction overlap in the characteristic of maintaining ecosystems. And combating extinction directly relates to protecting the current users as well as recognizing their finite quality, key components of sustainability. Due to distinct lineages of environmental and physiological factors, those species that vanish are highly improbable to re-appear.

Actually, the same can be said for languages and dialects. Within the five boroughs of New York City, about 800 languages are spoken, many of which are close to extinction due to reductions in intergenerational transmission (Conrad 2020). While globalization promotes communication across fewer and widespread platforms, language remains a vital tool for self-expression and designation.

VEs: This is both fascinating and troubling, of course. It sounds like we need more knowledge and experts to help us understand the city.

MJ, PA and NG: There is a host of experts in various fields ready to explain the dynamics of cities and its human and nonhuman inhabitants. An increasing number of urban ecologists examine how our artificial environments are hastening and altering the evolution of the animals and plants around us.

These ecologists have taught us that behavioral changes occurring between generations of urban dwelling species have caused species to adapt to city developments and technologies. The ecologists have exposed just how stunningly flexible and swift-moving natural selection can be in the urban environment.

And city planners have followed suit by laying out the ways in which the human and the non-human world interact, while also planning for a more harmonious interface. Recognizing the colossal surface areas of buildings and roads, planners are injecting bioreceptive gestures into development patterns in order to address co-habitation. These metropolitan environmental studies are taken seriously at trendsetting universities.

Likewise with architects whose work has begun to take seriously the fact that buildings include both human and non-human inhabitants, and they seek to build for both, regardless of whether the inhabitants are desired or not desired.

And urban designers of a host of artifacts such as lampposts, benches, and trenches have also been working hard to make them inclusive for non-humans, work that has been informed by the field of inner-city informatics.

Indeed, the realm of urban humanities, such as historians, playwrights, novelists and musicians, has begun including the realm of non-human life in their work. How to mitigate the stress on urban non-human species runs at the core of the work of all these academics.

VEs: I can imagine that these are stories about some animals thriving while others suffer in urban conditions. How do we design so that animals prosper?

MJ, PA and NG: Animal Aided Design is the way forward. It operates in the threshold between human technology and the natural environment. The separation of the wilderness and the built environment. Architecture as a bioinformatic that can be repeated, adapted, and scaled to the intrinsic climatic demands of its context. Through this adaptation, the architecture is able to productively, in an ecological definition, impede the current extinction moment. A registrar of how living creatures mobilize, inhabits, and reproduces in the spatial realm. This meridian separates the inventions humans create to make life more productive and the evolved living flora and fauna adapted to the planet's nuances (McKibben 2006).

This methodology also connects cities to their surrounding hinterlands, and beyond to the larger biogeographical region in order to provide ecosystem continuity. It is a methodology that allows urban infill sites to contribute to regional trends. The inclusion of site-specific species needs within the early stages of the design and planning process will create appropriate frameworks to boost species numbers as opposed to late stage superficial greenwashing or hastily conceived measures. Planning that responds to all portions of a species life-cycle including predation and dependencies.

This framework then guides decisions about the contents of open or green spaces. The spectrum of how lush or barren, wet or dry, and permeable or impermeable, can be calibrated to mirror ideal conditions in the natural habitat. Intermixing and multi-use zones can foster better upkeep through importance to the overall design scheme. By determining the spatial requirements of a given species, the site can be adequately divided accordingly (Weisser and Hauck 2017).

And this spatial determination is then further broken down into smaller parcels that correlate to the various breeding, feeding, mating, and nesting activities. Accurately positioning and sizing these spaces will influence whether or not the species can survive on the project site. Without close attention to these parameters, the probability of survival is significantly hindered.

VEs: Many environmentalists talk about saving urban bees. How to help insects in city design?

MJ, PA and NG: Bees yes! But not only them. As the most diverse group of animals, insects pose the challenge of their accelerated life-cycles and various growth stages. From molting and metamorphosis, to hatching eggs and pollinating flowers, insects engage in a multitude of behaviors that present their own habitat demands. Insects have also most likely co-evolved with flowering plants, which creates a synergy that architects must respect. Operating above, below, and atop the ground plane, these animals have many characteristics that can be translated into morphological responses in architecture.

With pollination, a critical ecosystem service for human food systems, insect populations on site may traverse large distances to reach flowers and return. Urban fragmentation has stymied this process, as routes have been disrupted by buildings oblivious to this phenomenon, greatly impacting their ability to fulfill their niche and stabilization of food outputs (Tree 2019). Living at the micro-scale, insects depend upon a level of granularity that can be ignored by building materials and dynamics. Delicate habits and breeding regimens cause issues for designers because these traits

call for a higher resolution in detailing than budgets nor time allotments traditionally grant. Surface treatments and deformations that are suitable for insects are the first step towards making this boundary between artificial and natural systems amenable. Perforation and reflectivity also influence insect navigation and wayfinding abilities.

Another obstacle to designing for insects is the perception of them as pests or nuisances to urban life. Doused with insecticides or pesticides, the human response to insects can escalate up to complete termination. Whether it be an outdoor space that has been colonized or a building edge or overhang that hives have been built into, the discernment that eradication is the primary objective positions this discourse in a punitive territory. Certainly insects that act as vectors for diseases do not ease these tensions. However, building awareness on the intricacies of ecosystems and the role insects play in maintaining that balance ameliorates concerns of their value (Monbiot 2015).

VEs: How about plants? How do we create a better design for them?

MJ, PA and NG: Through urban farming, for example. Technological advancements fundamentally change the way we cultivate our food, build our homes, and move throughout the landscape. Seemingly ceaselessly, they accelerate our means of production and extend our lives. Urban farming promotes edible plant growing practices in cities that substitute swaths of land for lighting and root interventions that culminate in yields without agrochemicals.

And then we can improve our leftover spaces, such as alleyways, sidewalk swales, rooftops, and facades. Farming in the city dictates an examination of altered growing conditions and feasibility in terms of a reliable alternative to peri-urban farm systems.

From this array of city spaces, building materials and forms can be designed for bioreceptivity, through crevices, niches, and deformations for plants to take hold. By examining holdfasts and root structures, I believe architecture can produce an outer membrane that fosters plant growth.

Actually, vascular plants are a foundational element in terrestrial ecosystems, thus designing for their life conditions, creates opportunities for insects and other animals alike. As primary producers, plants serve all animals through their ability to convert light into eventual biomass. Urban environments have also created an ideal habitat for epiphytes, which climb masonry walls to dedicate their precious resources to leaves versus stem rigidity. Plant-aided design emphasizes a systems approach to trees in that groupings and clusters fare better in resistance to disturbances.

We need to investigate and discover new uses or applications for plants. Plant-based replacement products that perform as effectively as the originals are

quickly supplanting their carbon-intensive incumbents. Genetically engineered plant-based foods are matching the color, texture, taste, and content of rival meats. Thus, plant-aided design extends beyond optimization for a singular plant, but advocates for cross-species interventions.

VEs: How about our carbon footprint? How do you mitigate for that?

MJ, PA and NG: As we continue to expand the scope of the concept of “ecological footprint” and “carbon neutrality” of cities, more variables are added to the calculation to determine our impact. Traditional inputs such as consumption of natural resources, energy exerted to power buildings and transportation, and land area developed, are augmented by biodiversity indexes and species counts. Recording and distillation methods provide a comprehensive understanding of human inhabitation upon the landscape. Furthermore, these formerly immeasurable attributes are becoming increasingly quantified through sophisticated modeling and machine learning. Biodiversity monitoring presents temporal and regional challenges, with baselines and reference areas difficult to establish, since the human-to-animal interaction on a specific site is difficult to replicate.

I believe biodiversity averages can be added to carbon footprint calculations as part of the systems approach that is now covering the complex interactions between humans and animals. Adding species loss or gain per dedicated areas to food, transportation, and energy usage statistics clarifies our environmental impact (Figure A2).

Also, by tracking human consumption trends with species recovery or decimation surges, our footprint gains coherence and robustness. Often, our most damaging environmental activities can be better quantified through the impact on species, because of the diversity and variety of responses by species. This mixed response depicts a spectrum of impact that has been calibrated by natural resiliency forces.

VEs: You base your arguments on science. How about indigenous knowledge?

MJ, PA and NG: Good question. I believe novel investigations into how indigenous cultures live with non-human species have enriched our conversations about a more inclusive urbanity. Impoverished and segregated communities have given us hard-learned tools for urban adaption. How to live in a more productive way with the non-human world is often a type of know-how generated far away from

highbrow academia and fancy design studios. These empirical sets of information, often passed down from ancestors, present field verified approaches to sustainability.

I think that by reversing engineering theory, as opposed to imposing theory upon practice, tested methods that are climate specific can become guidelines for an altered living condition in which non-human species thrive concurrently. Generally, it is important to begin unlocking the practical skills of living with nature that exist in many urban societies of the Global South. Skills that have already identified the advantageous materials and methods of construction endemic to a locale. Structures that have been designed with nature in a manner that is innately resilient to the region's forces. I am thinking of site specific interventions composed of the site itself. Building materials that coalesce and lignify over time, gaining strength and longevity.

I think the idea of "progress" may have hindered an appreciation of the sustainability of some traditional urban fabric wherever they are, as in pedestrian informed European cities or animal husbandry in Chinese municipalities.

VEs: What is the role of technology then?

MJ, PA and NG: These mitigation strategies are not abandoning or halting technology. A return to pastoral landscapes or pre-industrial times is not an option. As the global population nears eight billion people and energy usage continues to rise, technology has the scalability to address these burgeoning demands. Machines innately do not improve or impair our lives, but rather it is the application of machines that determines if they make a positive or negative contribution. Human ingenuity embodied in microchips to the Large Hadron Collider teach us phenomena about the natural world in order to better understand and live within it.

I agree. Environmental Luddites are not productive. Instead new technologies, such as wind turbines, solar cells, energy saving batteries, electric cars, geothermal energy, heat exchange systems, etc., may help the urgently needed urban transformation. As implementation scales upward, the systems will become more efficient with performative benefits.

And note that the search for sustainable technologies is not only a search in the unknown. The transfer of know-how from one geographical region to another may be of help. Releasing the spatial constraints of successive environmental responses will combat global shared issue; that have been mitigated in one part of the world, but still remain in other regions.

The problem of increasing heat waves in Australia and California, for example, may be addressed in contemporary as well as traditional design solutions to high temperatures in Islamic cultures of design.

Likewise, a host of design solutions to heat were widely used architectural and urban design solutions made before the invention of air-conditioning systems. Technology didn't harbor the lackluster building interiors that resulted after air conditioning was implemented. Rather, buildings shifted cultural and spatial attributes to technology, which led to mass minimalism and the disconnection from nature.

VEs: So what is the conclusion?

MJ, PA and NG: As clusters of human activity and environmental impact, cities need to recognize their role in promoting biodiversity within their ecological footprints. With Animal Aided Design, architecture can allocate physical space to facilitate ecological processes and recovery from intensive development. Often settled around or atop relics of natural habitats, such as forests or rivers, cities inherited biodiversity due to these resources. Humans specifically chose regions to settle with gargantuan amounts of resources to convert and exploit into economic gains, often without concern for the long term consequences of our disruptions. As centers of importation, cities spread and naturalize invasive species. These actions have negatively shifted growth patterns and distribution. As we traverse and infiltrate areas previously undisturbed, we bring with us our methods of extraction and waste production, ultimately leading to the decline of the non-human sector. Animal Aided Design re-orientes site analysis, design, and construction towards inclusion of species needs within our urban fabrics. Expanded calculations and metrics perpetually quantify human-to-animal interactions as studies depict the far-reaching results of urbanization.

Note: A version of this text was initially created for the blog <https://public.imagingamerica.org/blog/article/transitioning-to-urban-diversity/>.

Appendix A

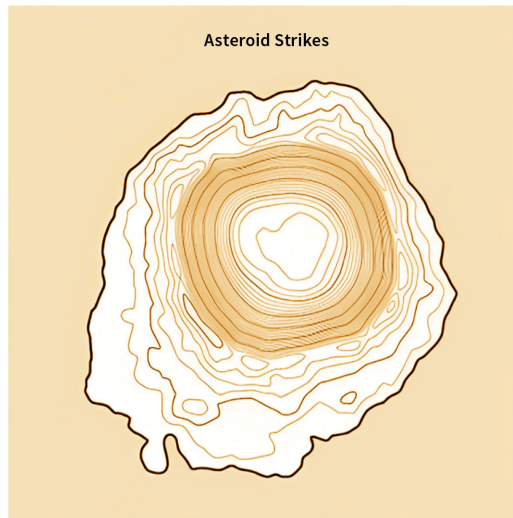


Figure A1. A primary cause of extinction, asteroid strikes. Credit: © Terreform ONE, used with permission.

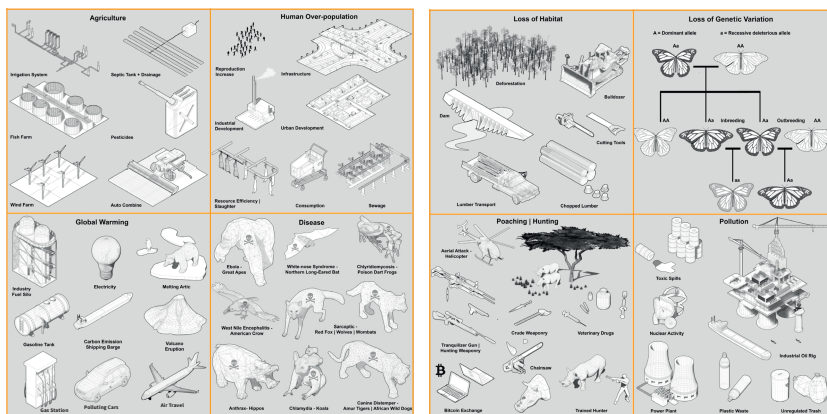


Figure A2. Primary causes of extinction, human and environmentally driven factors. Source: Authors' compilation based on data from; "Biodiversity Loss, Ecology", John p. Rafferty, Encyclopædia Britannica, UK. 11 November 2023.

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