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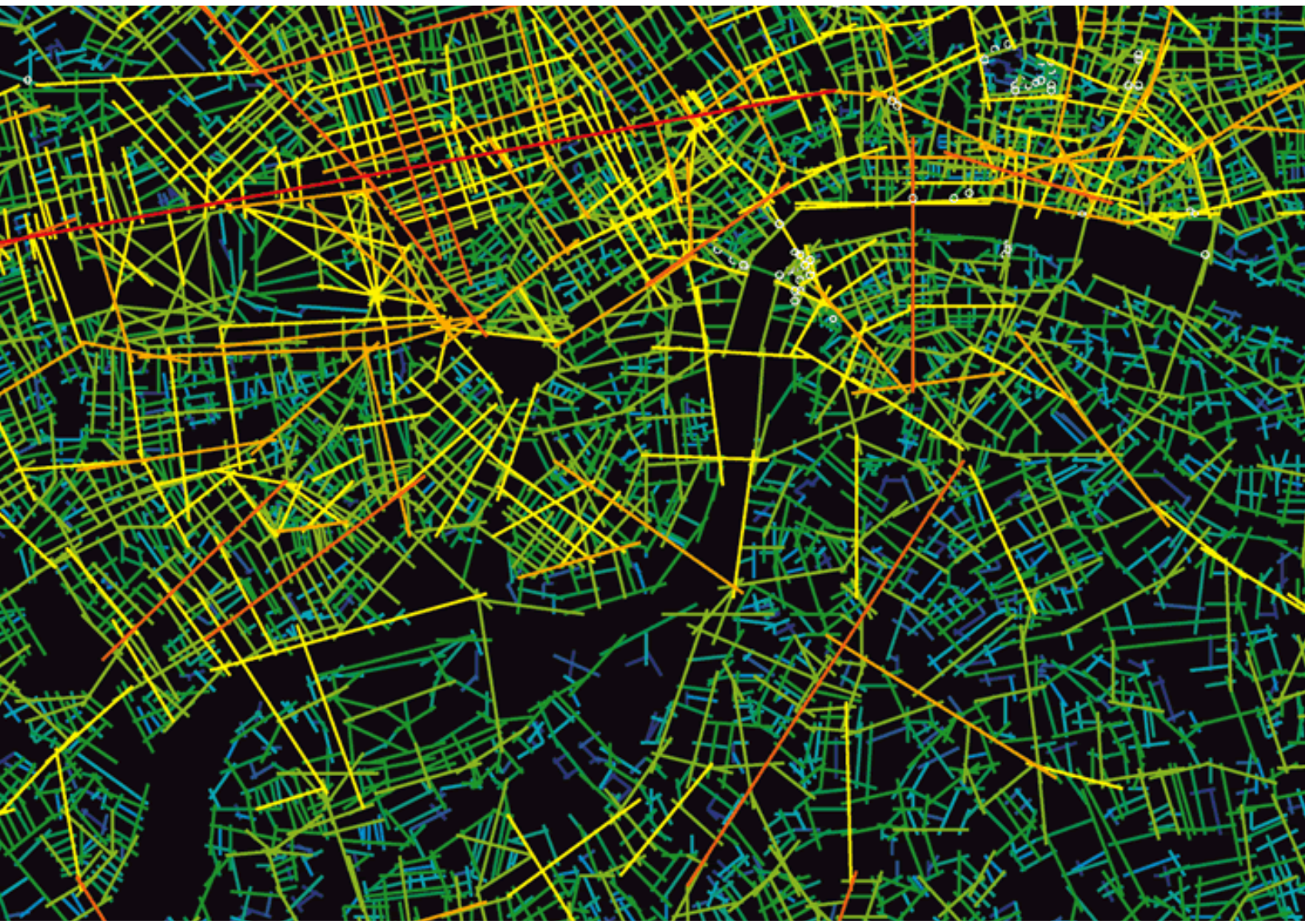
CENTER FOR HUMANS AND NATURE

Expanding our Natural and Civic Imagination

MINDING NATURE

a journal exploring conservation values and the practice of ecological democratic citizenship



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CONTENTS

VOLUME 5 ISSUE 1

ARTICLES

An Introduction to "The Center for Humans and Nature Manifesto"
By BROOKE HECHT AND CEARA DONNELLEY // *PAGE 9*

The Center for Humans and Nature Manifesto // *PAGE 10*
With introduction and context by Center President Brooke Hecht and Board Vice-Chair and Special Counsel Ceara Donnelley, MN is pleased to print this statement of values, concerns, and practical engagement for change.

To Build or Not to Build a Road: How Do We Honor the Landscape through Thoughtful Decision Making?
By INGRID LEMAN STEFANOVIC // *PAGE 12*
Highlighting six essential elements of good planning and decision-making, this thoughtful article explores the pivotal role that values and imperfect knowledge play throughout the decision-making process, from the initial identification of objectives to the eventual evaluation and adjustment of an ongoing project.

Reconciling Mobility: Redesigning the Road, Reweaving Landscape
By NINA-MARIE LISTER // *PAGE 19*
Integrating analysis with striking and illustrative photographic images, this article focuses on the planning and design challenge of reconciling mobility with landscape. Lister gives special attention to the issue of preventing deadly encounters between wildlife and motor vehicles and creative design of roadways to compliment the surrounding landscape.

FEATURES

From the Editor
In Place
By BRUCE JENNINGS // *PAGE 4*

CHN Bookshelf // *PAGE 34*

The Last Word
Embracing the Call for a New Civic Discourse
Christopher Sherman // *PAGE 35*

REVIEWS AND REFLECTIONS

Bringing People Together or Keeping Them Apart: The Spatial Configuration of Roads and Other Pathways
By DAVID SEAMON // *PAGE 30*

Place Re-imagined
By JULIANA DEVRIES // *PAGE 32*

FROM THE
EDITOR

IN PLACE

WHEN THE IDEAS OF OUTSTANDING philosophers and novelists converge, we should pay attention. In books like *Getting Back into Place* and *The Fate of Place,* the American philosopher Edward Casey has written powerfully on the difference between the concept of place and the concept of space. Using a different vocabulary, the Czech novelist Milan Kundera presents essentially the same idea in the passage from *Immortality* quoted by Ingrid Stefanovic at the beginning of her essay in this issue. Kundera meditates on the distinction between a "highway" and a "road." A highway is a meaningless line between two points. A road overflows with meaning, association, and invitation.

Kundera locates both highway and road in what he calls "space," which is devalued by the former and brought to life by the latter. But he could have used Casey's terminology without missing a beat and said that highways are in spaces, while roads are of places. The concept of space is essentially an abstract and geometrical one; it is the zone of pure thought where highways dwell, and the mind has no time to spare for meandering or sightseeing on its journey to some precisely specifiable point. A place, on the other hand, is a tangled bank and a winding path; it is a location of roads and side trips and unexpected turnings.

What is significant about places is not so much their physical dimensions as their imaginative possibilities. They are not occupied, like spaces, as a container of height and width and depth. They are dwelt within by living things; and through memory, myth, and meaning inanimate things can be alive in place as well. Places are the surroundings of Walden Pond and Tinturn Abbey. They are made such by the perceptions and sensibilities of Thoreau and Wordsworth and you, me, and everyone who lives a life somewhere, as opposed to nowhere or anywhere.

Did I just say that living is enough to make a space a place? Or is it a certain quality and kind of living? Does the concept of place have particular values and ideals built into its very meaning perhaps? Like Schrödinger's cat in a box, which can be dead and alive at the same time, can somewhere be both a space and a place, depending on what happens there and the spirit in which it happens? When people talk about the project of "place making," how casual or how deep a statement are they making? Those of us who aspire to transform what now are abstract spaces into more richly indwelt places would do well to attend to the value-laden nature of our enterprise and to be as clairvoyant as possible about what those values are.

Here is a story that might nudge us in that direction. On Friday, January 12, 2007, during the morning rush hour, the virtuoso violinist Joshua Bell performed incognito for nearly an hour in the L'Enfant Plaza Metro station in Washington, DC. He played many pieces, some simple and some complex, on his instrument, which had been made by Stradivari in 1713 and is named the Gibson ex Huberman. It has a checkered history: stolen twice in the twentieth century from its previous owner, Bronislaw Huberman, it has its own tale to tell of disappearance, mystery, and reemergence. Even in the tunnels of the subway station, the sound quality was excellent. A Bell performance is something that normally countless people pay hundreds of dollars each for a ticket to hear. That day it

BRUCE JENNINGS

FROM THE
EDITOR

was free—although, busker that he was, he put his open case on the floor to accept tips.

While Bell played, 1,700 people walked past (observers from the Washington Post were videotaping the scene and counting). They hurried by, on the highway from point A to point B. Only a handful tossed a bill or some coins into his case, and just seven people stopped to listen for a time. There was never a crowd; a place of connectivity never formed (Cf. Gene Weingarten, "Pearls Before Breakfast," available at http://www.washingtonpost.com/wp-dyn/content/article/2007/04/04/AR2007040401721.html).

> It takes a heap o' livin' in a house t' make it home,
> A heap o' sun an' shadder, an' ye sometimes have t' roam
> Afore ye really 'preciate the things ye lef' behind,
> An' hunger fer 'em somehow, with 'em allus on yer mind.
> It don't make any differunce how rich ye get t' be,
> How much yer chairs an' tables cost, how great yer luxury;
> It ain't home t' ye, though it be the palace of a king,
> Until somehow yer soul is sort o' wrapped round everything.
>
> Home ain't a place that gold can buy or get up in a minute;
> Afore it's home there's got t' be a heap o' livin' in it;
> Within the walls there's got t' be some babies born, and then
> Right there ye've got t' bring 'em up t' women good, an' men;
> And gradjerly, as time goes on, ye find ye wouldn't part
> With anything they ever used—they've grown into yer heart:
> The old high chairs, the playthings, too, the little shoes they wore
> Ye hoard; an' if ye could ye'd keep the thumbmarks on the door. . . .
>
> **Edgar Guest**
> "Home"

What shall we make of this? What does it tell us about place? To me it is a reminder that place functions to give us a stability of expectations. This experiment contrived by a writer for the Washington Post is perhaps a little too easy because of the radical contrast and anomaly it presented to the people in the station. On one level anyway, the way people behaved is not surprising, and their sense of place has something to do with that. Bell is not the kind of celebrity who is likely to be recognized out of context; indeed, no classical musician is (maybe Pavarotti, with his signature girth, or Leonard Bernstein in his day are the exceptions that prove the rule). Lady Gaga no doubt would have gotten a different reception, as would maybe even Paul McCartney or Bruce Springsteen (I date myself, I know). Also, it is not unusual to encounter musicians playing in the subway corridors, and the standard behavioral norm is not to attend their performance but to be on one's way. So the sense in which the Metro is a place—albeit not a very attractive or inviting one—conspired to lead the people to do precisely what they did: to hurry on.

Place in its stability-reinforcing functions does not immunize us from a condition called "face blindness," or prosopagnosia. People with this condition, like the famous neurologist Oliver Sacks, cannot recognize people they know well if they encounter them out of context, in an unfamiliar setting or in the wrong place. A strong sense of place may actually dispose one to a figurative kind of prosopagnosia in that we can become so indwelling in a familiar place that we become quite disoriented when we are thrust into the anomalous situation and the unknown circumstance. I am a Hoosier who moved to New York City, and I know whereof I speak.

On the other hand, the fact that not just face blindness but

FROM THE
EDITOR

also aesthetic blindness was displayed that day is harder to fathom. Bell may have blended in, but his music did not. The fact that people were not attentive to what they were actually hearing, that they seemed disabled from hearing what was actually there, is not a manifestation of their residing in a definable place with its settled routines and patterns of conduct. It is surely a manifestation of the way in which surroundings and locations, like a highway or a subway, become abstract spaces of mere transit or some other essentially instrumental and utilitarian preoccupation. This tale then is both about place as settled expectation and the absence of place (place become mere space), which deadens sense and sensibility. It shows the void in our lives that ensues when we close in, turn up our collars, and hurry on, rather than opening out to surprise and joy.

So here are at least two of the many substantive values that seem to me to reside in the concept of place. One is open familiarity. The other is mobile rootedness. You will notice that these are deliberate paradoxes. But they are not, I think, contradictions.

Without the structure of the familiar at all levels—from the sensory to the social, cultural, and religious—our world would be, as William James put it, "one great blooming, buzzing, confusion." We need to assimilate the novelty, the otherness we encounter to that which is comprehensible to us. We do need to encounter the outsider—the stranger who is displaced or placed elsewhere—on our own terms. But these terms must not be static and frozen, for then they will not truly bespeak a place of living. We must be rooted. Like Antaeus, our strength comes from our connection to the earth. But we must also use our rootedness to move, to create in ourselves the capacity to increase our terms by embracing the terms of others.

The essays and images in this issue of Minding Nature exemplify a mobile rootedness and put us on the road to places of right relationship between humans and nature.

We begin with the Center for Humans and Nature's Manifesto, a short document that emerged from long discussions among members of the staff and board of directors. In a sense, Strachan Donnelley (1942–2008) was the Center's living manifesto. After his death, we came to feel that we needed to put something in written form, a statement that would attempt to capture his legacy and the forward-facing nature of our ethical commitment to the human and the natural world.

Each one inevitably inadequate, all statements of this kind are important, I believe, because they provide different ways of articulating a vision and a warning that in our society and in the current state of the planet simply must be given a voice. We were pleased to offer to our readers "The Blue River Declaration" in Minding Nature 4.3 (December 2011). With an introduction by Brooke Hecht and Ceara Donnelley, we now offer our statement of values, a diagnosis of current problems, an analysis of what needs to be done, and some ways in which the Center for Humans and Nature is striving toward achieving a better future.

This year the Center is beginning a new research project on Frontiers of Ethics: Care and Place, under the auspices of its Ideas of Humans and Nature Program. In moral philosophy, an ethic of care has be-

BRUCE JENNINGS

FROM THE
EDITOR

come a well-developed alternative to other ethical approaches based on utilitarianism, the concept of rights, and distributive justice principles. These latter frameworks seem abstract, formal, and individualistic, whereas an ethic centering on the ideal and the lived experience of caring can express the concreteness of people as mortal, vulnerable, and embodied selves. However, this ethical framework and its characteristic perspective have not been brought fully to bear on questions of ethical responsibilities toward non-human life and ecosystems.

Place is another concept that currently lies at the frontiers of ethical thought. As I alluded to above, its orientation is an emphasis on specific relationships in particular places and landscapes, both natural and social. Most work in moral philosophy and Western ethics is abstract in the sense that it seeks to discover standards of right and wrong that are universally valid and applicable. Paradoxically, moral psychology tells us that ethical thinking and our sense of value are rooted in specificity, not universality—that is to say, in the lived experience of place, with specific natural and social characteristics, landscapes, and cultures.

The core of this issue is two essays by Ingrid Leman Stefanovic and Nina-Marie Lister, who are Senior Fellows of the Center in 2012. In these essays the perspectives of care and place take shape in the context of landscape design and transportation planning. In January they contributed to a new Center publication entitled, "To Build or Not to Build a Road . . . How Do We Honor the Landscape?" (available at http://www.humansandnature.org/roads). Their longer discussions here explore these issues in greater depth.

Stefanovic focuses on what the National Research Council has referred to as "the elements of a responsible and competent decision-making process." She highlights six essential elements of good planning and decision-making and shows the pivotal role that values and imperfect knowledge play throughout, from the initial identification of objectives to the eventual evaluation and adjustment of an ongoing project. She illustrates her analysis with a number of telling examples, from the perspective of First Nations communities in Canadian land-use planning, through the split-second decisions of pilots and military personnel in combat, to the tragic story of the death of a large number of smoke-jumpers in the Mann Gulch fire of 1949.

In an integrated analytic and photographic essay, Lister focuses directly on the planning and design challenge of what she aptly calls reconciling mobility with landscape. She gives special attention to the issue of preventing deadly encounters between wildlife and motor vehicles. Animals are mobile, and they need "roads," too—that is, connectivity in their landscape and habitats. Intelligent design of human roads can accommodate these respective mobility needs and can relate humans and nature properly and creatively. She indicates that we should not fragment our planning imagination as we often do: efficiency here, safety there, aesthetics over there. Instead, we can integrate elements. Roadway access, design elements, and materials can incorporate wildlife mitigation structures in ways that fit and increase the interest of the preexisting landscape. Lister indicates how this can be done with reference to finalist entries in the 2010 International Wildlife

FROM THE
EDITOR

Crossing Infrastructure Design Competition.

Rounding out this issue, David Seamon discusses the work of British architectural theorist David Hillier, and the ways in which the physical arrangement and design of pathways (roads, sidewalks, even building corridors) have significant social effects. Julie DeVries reviews Doreen Massey's important book on the concept of place, *World City*. Chris Sherman has the Last Word with a wonderfully care-sensitive and place-oriented reflection on democracy and civic life.

Highway versus road, space as distinct from place. Here's another: the poet Edgar Guest's distinction between house and home. Once you grasp the basic idea, a large number of such discernments arise when you begin to think about it. The different words don't matter much, the forms of life behind them do.

Introduction to the Center for Humans and Nature Manifesto

By BROOKE HECHT AND CEARA DONNELLEY

As a fly-fishing philosopher (as he often called himself), Strachan Donnelley saw an urgent need for an organization dedicated to exploring the ethical dimensions of the relationship between humans and the natural world. Strachan founded the Center in 2003, after decades of work in the bioethics field revealed that serious bioethics work was largely reserved for human and social issues. The roots of his vision for the Center were in his experiences as a thinking wild one, as he called all of us humans. Whether in a trout stream or at his writing table, Strachan grappled with big ideas about who we are and what our place is in the world—and what it could be.

Strachan envisioned an organization that could serve two critical goals: to serve as an honest broker of knowledge, pulling together the best academic scholarship and conceptual research; and to develop ideas and fresh interdisciplinary perspectives at the cross-section of conservation and ethics. Strachan believed that creative interdisciplinary dialogue would provide a basis for a more expansive vision of ethical responsibility that includes—and integrates—humans and nature.

There is a growing recognition that values are at the center of our most intractable challenges, but the conservation community often struggles to understand and express its values adequately and effectively. For example, conservation goals are frequently framed in terms of economic benefits or individual self-interest. Insights from social psychology reveal that this approach usually backfires. Using self-interest as a motivator rarely works if personal cost is simultaneously required, while appealing to the common good can be more effective because it avoids such contradictions. However, the conservation community is not accustomed to framing goals and making arguments using ethical language. Importantly, this is not only a question of crafting a message and using the appropriate language. As Strachan noted, the core ethical constructs relevant to sustainable living are yet to be fully examined, developed, and deployed. True to Strachan's vision, the Center has been home to original research, critical ethical thinking based on sound science, and practiced collaboration focused on the socio-ecological challenges we face.

It's hard to believe that Strachan died almost four years ago. For all of us who knew Strachan, his death came far too suddenly and too soon. As the board and staff of the Center have sought to carry on his work, we have also strived to express the collective values that draw us to the work we do and connect us to the work of Center colleagues. The statement you find here is the result of a collaborative staff and board effort during 2011 to express the values, beliefs, and intentions of the Center for Humans and Nature. It is—in short—our manifesto.

Brooke Hecht is the president of the Center for Humans and Nature. Ceara Donnelley is vice chair of the Board of Directors and strategic counsel at the Center for Humans and Nature.

The Center for Humans and Nature Manifesto

WE VALUE:

- Community, interdependence, and connectivity.
- The intrinsic link between freedom and responsibility, for both individuals and communities.
- The capacity of the Earth to nurture life and sustain its ecological and evolutionary processes.
- The integrity, health, and resilience of our interconnected human and natural communities.
- The diversity, beauty, and inherent creativity of nature.
- Deliberative democracy carried out by an engaged, informed citizenry.
- Justice and equity in our economic systems and relationships.
- Consideration of the needs of multiple generations – for all species.
- Creative approaches to conservation and restoration throughout our landscapes.
- The cultivation of empathy and humility in the face of complexity.
- Varied ways of knowing the world and the insights that multidisciplinary and multicultural approaches can reveal.

Our dominant contemporary culture rests upon several tragically flawed premises: that humans are separate from nature, that nature is merely raw material for human use, and that it is acceptable and "natural" for humans to exert unlimited control over nature. Furthermore, contemporary culture largely regards the natural world as a fragmented collection of discrete parts, rather than as an integrated, living, co-evolving whole. This atomistic and disintegrative perspective ignores current scientific knowledge and distorts our sense of self, nature, community, economy, and democracy.

WE RECOGNIZE THE CONSEQUENCES OF SUCH AN IMPOVERISHED WORLDVIEW, WHERE:

- Non-human life is not included in our understanding of community or democracy.
- Nature in its many forms—non-human animals, plants, soils, waters, oceans, minerals, and even human labor and the human body—is increasingly commodified and seen as objects to be bought and sold.
- Surrounded by "commodities," human beings become essentially "consumers" within an artificial economic reality.
- Meaning is derived largely through consumption, competition, and self interest.
- Understanding ourselves as owners of land, water, and air, humans act as if we have no responsibilities in relation to these systems of life.
- Human economies and communities are not seen as dependent upon and embedded within the natural world, nor as subject to its real ecological constraints.
- The authentic and ultimate sources of wealth in nature are disregarded.
- The distribution of wealth is unjust, with extreme inequities between rich and poor.

- "Progress" in science and economics is defined without reference to ethical principles, frameworks, and unique realities of place.
- Political systems are subject to corruption as narrow interests gain power over the long-term public interest.
- Typical "solutions" to social and ecological challenges are myopic, reductionistic, and driven by short-term thinking.

WE AT THE CENTER FOR HUMANS AND NATURE BELIEVE:

- That "business as usual" is not inevitable; we can create the future we seek.
- That there is urgent and immediate need for change.
- That change need not come about by coercion, but can take place through cultural transformation.
- That the loss of biological diversity and the degradation of soil, water, and air quality are the most fundamental economic losses.
- That human beings are capable of creative imagination and empathy, and are able to recognize and respect the intrinsic value of life.
- That "rights" are not reserved only for human beings and that, furthermore, human rights are properly understood to entail responsibilities – to all people, generations, species, and ecological systems and processes.
- That extinction is a "bottom line" event that we should not knowingly cause.
- That insights from contemporary evolutionary biology and ecology allow us to overcome a fragmented vision of reality and see the individual within the context of kinship, community, relationship, and interconnectedness.
- That ecological realities and constraints, not currently recognized by the dominant ideology of economic growth, offer opportunities for social and spiritual development.

THE CENTER FOR HUMANS AND NATURE PROMOTES:

- Creative ways of thinking about ourselves and our relationship with nature.
- Imaginative approaches to sustainability, progress, growth, wealth, and the common good.
- Restoration to a socially and ecologically interconnected world through democratic ecological citizenship.
- Cultures and communities that integrate science and religion, emotional intuition and rational thought, philosophy and action, biodiversity and human well-being, conservation and economic plenitude.

We act upon a simple, but profound conviction: that ideas and ideals matter.

To Build or Not to Build a Road: How Do We Honor the Landscape through Thoughtful Decision Making?

By INGRID LEMAN STEFANOVIC

> *A highway has no meaning in itself; its meaning derives entirely from the two points that it connects. A road is a tribute to space. Every stretch of road has meaning in itself and invites us to stop. A highway is the triumphant devaluation of space, which thanks to it, has been reduced to a mere obstacle to human movement and a waste of time. . . . Road and highway: these are also two different conceptions of beauty.* —Milan Kundera, *Immortality*

Every summer, my husband and I roll back the canvas roof of our small Citroen 2CV and head out to explore small towns, farming communities, forests, and parkland along beautiful, picturesque rural roads that are untraveled by most Ontarians. Leaving highways behind, we meander through landscapes that open up unique visual and olfactory experiences that enrich our days and become a staple in our store of happiest memories together.

Roads open up inimitable vistas and opportunities but, of course, they also have their costs, particularly when they take the form of large-scale highways that often infringe upon agricultural and wildlife communities or exacerbate urban stress.

What constitutes a good road? And how do we decide when it is appropriate to build a new road? As urbanist Jane Jacobs puts it, "how to accommodate transportation without destroying the related intricate and concentrated land use?—this is the question."[1]

Presumably, decision making in such a case ought to be driven by more than mere sentimentality. In the words of the National Research Council, "practical decision making begins by identifying the elements of a responsible and competent decision-making process."[2]

At the same time, it is important to recognize that complex environmental decisions—from how to tackle global climate change to planning megalopolitan settlements—often must be made in the face of scientific uncertainty. In such cases, judgment calls are made, and, therefore, we need to better understand both the nature and the significance of taken-for-granted values, attitudes, and perceptions.

I begin this paper by identifying some essential elements of what might typically be described as a "rational" process of decision making. I then proceed to describe how such a rational environmental decision procedure must reflect not only narrowly logical reasoning processes but also essential elements of moral virtue, wisdom, and, ultimately, a respect for sense of place.

FROM IDENTIFYING OBJECTIVES TO VIABLE ALTERNATIVES: THE PLACE OF VALUES

From engineering consulting firms to governmental environmental impact assessments, technical models are utilized to ensure that complex problems are addressed in a comprehensive manner. Decision trees, cost-benefit analyses, and decision-making matrices that employ sensitivity analysis or analyze expected monetary value are examples of such tools.[3]

While each model incorporates distinct strategies, it is feasible to draw from these examples six major generic steps that are typically reflected in such models, despite their variations. These include:

1. *Identify the project objectives, problem, and opportunities.*
2. *Identify constraints that possible solutions must respect.*
3. *Identify viable alternative solutions.*
4. *Select evaluation criteria of alternatives.*
5. *Evaluate alternatives and select the preferred option.*
6. *Monitor and adjust the strategy, as necessary, documenting lessons learned.*

Like the technical models listed above as well as other similar decision-making procedures, this six-step decision-making process aspires to be rational, logical, and, thereby, comprehensive.[4] Yet I would contend that genuine thoughtfulness is not necessarily achieved simply by virtue of such sequential logic.

Embedded in such apparently "objective" models are personal biases, value judgments, hidden paradigms, and different worldviews. Genuinely rational choices—those that aim for wisdom over mere technical efficiency—are made only if these taken-for-granted values and assumptions are explicitly addressed. The fact is that "value choices are often hidden in the simplifying assumptions of analytic techniques, and the assumed values may not be universally shared."[5]

It is important to recognize that values and assumptions impact every phase of decision making, no matter how logical, linear, and "objective" that process appears. For instance, value judgments very much shape the first step in the decision-making process, where project objectives, problems, and opportunities are identified and bounded. The fact is, as energy scientist Amory Lovins points out, that "the answers you get depend on the questions you ask."[6]

So, despite the title of this paper, it is important to note that the problem to be addressed here may not be properly scoped in the form of the engineering question whether to build a road. Rather, the problem may actually be that travel times are currently too long; or perhaps, as in the case of some First Nations communities in Northern Canada, there may be a lack of easy access. Maybe the issue may be as broadly scoped as to ask the question about how to build a healthier, more sustainable community overall. The opportunities identified may certainly include the construction of a road, but, alternatively, a preferred option may consist of improvements to public transport or rail systems instead. After all, in the words of Jane Jacobs, "The more space that is provided for cars in cities, the greater becomes the need for use of cars"—which, in an era of global climate change, is hardly a wise course of action.[7] Unless one scopes the problem sufficiently broadly, productive alternatives may simply be missed.

Even if the problem has been appropriately scoped, many project managers often underestimate the impact of local communities' core values when one moves to the second step of our "rational" decision-making process to identify possible *constraints*. Canadian philosopher Bruce Morito tells a story about how ecological constraints and a community's core values had to be made transparent as part of an informed decision-making process. In an environmental management forum, a resource manager informally asked Morito why Aboriginal people were "so intransigent and stubborn when it came to negotiating the building of dams on their territory." The manager acknowledged that ancient burial grounds would be flooded by new dams, but the communities would be compensated "more than adequately" and at "greater than market value" through the formal agreements. It seemed "unreasonable," under these circumstances, to refuse the dams. Morito's response was to ask him "whether he would sell his daughter into slavery for an amount that would be considered 'more than adequate compensation' according to the current market in slavery."[8]

"It is important to recognize that values and assumptions impact every phase of decision making, no matter how logical, linear, and "objective" that process appears

By providing such an analogy, Morito was able to capture how First Nations' belonging to the land reflected a core value amongst their community that was

as non-negotiable to them as the sale of the daughter would be to the resource manager. Morito convincingly argues that the task for philosophers and ethicists is, in such cases, to serve as "stand-in interpreters . . . by helping communities identify, categorize and evaluate their values . . . to achieve cross-cultural understanding and agreement" (an approach with which I personally very much empathize), rather than to engage in "traditional" speculative philosophical theorizing.[9]

> Even if the problem has been appropriately scoped, many project managers often underestimate the impact of local communities' core values…

Values infuse every stage of the decision-making process. For instance, in step three, *identifying viable alternative solutions*, it becomes important to ensure that broad and meaningful stakeholder consultation has been undertaken. An example relating to the City of Toronto's Biosolids and Residuals Master Plan (BRMP) is a case in point. A standardized weighted/scoring decision-making model was utilized in 2004 to recommend options for bio-solid treatments that included a new fluidized bed incinerator in an existing water treatment plant. Pressured by local communities and two city councillors who opposed incineration, the city was forced by 2007 to convene a seven-member, expert peer review panel to evaluate the effectiveness of the decision making model used to develop master plan recommendations.

The panel found that there was room for improvement in the public consultation process.[10] In fact, local residents' concerns about incinerators were highly underestimated by consultants. Given the community's entrenched and ultimately unwavering opposition to incinerator technologies, offering the incineration option as a "viable alternative" may have been misplaced. While some believed that, given recent technological improvements, the local community's risk-aversive attitude was unjustified, the fact is that these community-wide perceptions were not addressed and, in the end, interfered with the implementation of the master plan's recommendations. A more thorough consultative and collaborative engagement with the community might have saved the city considerable time and money in this particular case.

Both of these examples of First Nations' values and local communities' prejudices against a particular technology help to remind us that when a new road is being proposed, it becomes equally important to identify core values of stakeholders. Some may feel, for instance, that protection of a unique ecosystem is simply non-negotiable and the road will, under all circumstances, be required to traverse it without negatively impacting biodiversity and wildlife populations. Making such core values transparent is essential to identifying constraints as well as viable, alternative solutions.

THE ROLE OF VALUES FROM CRITERIA SELECTION TO FINAL DECISION

When it comes to *selecting evaluation criteria* for alternatives that have been identified, it is wise to throw the net wide to include interdisciplinary perspectives. Our calculative worldview has led to increasing specialization, and yet it is important to think holistically and comprehensively when it comes to evaluating the value of specific options. The National Research Council has it right, to my mind, when they remind us that "with the growing number, complexity and importance of environmental problems come demands to include a full range of intellectual disciplines and scholarly traditions to help define and eventually manage such problems."[11]

In *evaluating alternatives and selecting the preferred option*, again, interdisciplinary collaboration and dialogue can only be helpful to the overall decision-making process. I am reminded of the work of Greek architect-planner Constantinos A. Doxiadis, who maintained that every human settlement, at scales ranging from a single dwelling to an urbanized planet, is defined by social, cultural, economic, regulatory, technological, and ecological functions.[12] It is only human to be motivated by our own professional interests, so a comprehensive decision-making process ensures that multiple voices, from transportation engineers to ethicists, are heard through mindful dialogue.

> Making … core values transparent is essential to identifying constraints as well as viable, alternative solutions

The core significance of such dialogue is reflected in a decision-making strategy that has been called CRM (Cockpit Resource Management, or more often, Crew Resource Management).[13] The approach was developed following a fatal United Airlines flight

in 1978. Nearing the runway of Portland, Oregon, the pilot realized that two indicator lights for his landing gear remained off, meaning that the front wheels were not properly aligned. Preoccupied with checking light bulbs and fuses as the plane circled the airport, the pilot failed to realize that, despite the flight engineer's repeated warnings, the plane was running out of fuel. The crash killed ten passengers and wounded twenty-four of the 189 on board. Later, the investigation revealed that the wheels had, in fact, been properly deployed and the problem was simply a faulty circuit. Had the pilot heeded his team's advice, the crash might have been avoided.

As a result, CRM was developed, emphasizing the need for collective decision making, and such a consultative, team-based decision-making approach has recently come to be employed in places like hospitals and critical care wards.[14] Beyond those environments, other decision makers would be well advised to heed these lessons learned.

In fact, given the situation of a proposed new road, one must not be inclined to simply give precedence to a limited group of technical "experts" who themselves are, after all, operating with their own set of deeply rooted values and assumptions. As time-consuming as an intensive consultative process may appear, it is essential to ensure that the solution is informed by comprehensive, multi-faceted understanding and consultations with an interdisciplinary expert audience.

> "...meaningful consultation with community members "on the ground" is essential

Moreover, meaningful consultation with community members "on the ground" is essential. Such local expertise may shed light on priorities that can only be revealed on the basis of everyday lived experience of an existing landscape. Despite the time commitment required, studies show that meaningful, one-on-one consultation with community members results in more sustained buy-in of proposed solutions and ultimately ensures that a decision-making process achieves goals of social justice, equity, and participatory democracy.[15]

Finally, there may be a need to *monitor and adjust the strategy,* given that "consultation" does not necessarily mean that conflicting interpretations of events will not arise. In fact, it becomes critical to devise strategies that will address attitudes and judgment calls at the root of many such conflicts. One case illustrates how such implicit value systems can shape stakeholder conflicts regarding interpretations of risk. The story begins in 1982, when the chemical giant Monsanto was asked by Health and Welfare Canada, the nation's federal health department, to produce replacement toxicological studies for a herbicide called alachlor that had been used for some years in soy and corn farming.[16] Scientific studies were conducted and results were submitted to the Minister, who expressed "grave concern" because of apparent "significant carcinogenic properties" of alachlor exhibited in rats.[17] For these reasons, the decision was made to remove alachlor from the market.

However, Monsanto pursued its right to appeal the decision, and a formal review board of scientists was struck to re-examine the decision. After forty-one days of public hearings, the board recommended *reinstatement* of the herbicide, despite the fact that they had drawn from exactly the *same* scientific data that informed the government's original recommendation. In the end, notwithstanding the review board's endorsement of the product, the government chose to uphold its original decision, and alachlor remains unregistered for sale in Canada to this day.

Why was there such a divergence when interpreting the significance of the identical set of apparently "objective" scientific data? The case reveals how conflicting value systems, rather than scientific data, generated the controversy. As the authors note, different stakeholders "were decisively guided by different value frameworks maintained, for the most part, implicitly and without recognition by the estimators."[18] Specifically, the review board (and others, such as Monsanto and even farmers) employed a *utilitarian* value system, balancing risks with the benefits of retaining market competitiveness. On the other hand, environmentalists, mothers, and the Minister were opposed *on principle* to any herbicide that presented a carcinogenic risk. Balancing costs and benefits simply was not an option.

This vacillation between utilitarian value systems and deontological approaches that seek to maintain principles of right and wrong irrespective of the overall "greater good" often lies at the heart of stakeholder conflicts. For instance, cost-benefit analysis may drive an engineering firm to recommend the building or siting of a road in a way that dissects a community because ultimately such a solution will reduce costs and benefit the region overall. On the other hand, that community may feel that it is simply wrong "in princi-

ple" to threaten its holistic sense of place. Making such value systems transparent can help to ensure that the roots of the conflict are addressed in stakeholder dialogue.

Each of these cases reveals how taken-for-granted values drive decision making. Sometimes, even personal biases affect our choices. Psychologists identify a number of factors, from motivational bias (will you, as lead designer of a road, typically feel inclined to identify possible structural weaknesses and warn against using it?) to a tendency to "anchor" oneself within familiar experiences.[19] For instance, a recent, serious budget overrun tends to incline a project manager to assess the risk of future budget overruns as being more likely simply because of the impact of these recent memories and the negative outcomes associated with such problems.

Often, it becomes important to address such biases and recognize their limitations. The story of Mann Gulch illustrates how important it is to rethink customary or habitual solutions to which we may become anchored. In 1949, a firefighting brigade was parachuted into the gulch where the Great Plains meet the Rocky Mountains. Due to changing winds, an initially small blaze eventually developed into a wall of flames two hundred feet tall and three hundred feet deep. The team leader ordered a retreat.

Realizing that the team would be unable to outrun the fire, which was now approaching at thirty miles per hour, the leader was forced to identify another solution in order to save himself. This counterintuitive technique amounted to intentionally setting the ground surrounding him on fire. As he lay flat among the cinders, the wall of flames passed him by, while thirteen other men were overtaken and killed. Besides the leader, only two firefighters survived by retreating to a crevice in the rocky foothills. The strategy the leader used was an unnatural option that his team did not understand. Afterward, though, this strategy became part of standard firefighting techniques.[20]

> "...[some] priorities ... can only be revealed on the basis of everyday lived experience of an existing landscape

The story shows how important it is to avoid relying upon familiar strategies and to consider instead more innovative, even non-conforming solutions to problems that arise within the process of decision making, whether the decision involves fighting fires or proposing new road developments.

PARADIGMS OF ROAD-BUILDING: BEYOND THE CALCULATIVE WORLDVIEW

Personal biases, societal value systems, and risk attitudes affect every stage of decision making, whether one is addressing the possibility of building a road or designing a new community. While many decisions are made utilizing the kind of "rational," step-by-step model that we have described in the previous section, the fact is that such linear approaches assume that reason is essentially a matter of scientific, ordered calculation. But "rationality" may mean more than mere calculation.

Once again, a particular case becomes instructive.[21] In an incident during Operation Desert Storm, when American Marines were to liberate Kuwait from Iraqi invaders, a fleet of coalition aircraft carriers were stationed twenty miles off the coast as backup for the ground troops. They were also thereby positioned in close proximity to potential Iraqi missile fire.

Lieutenant Commander Michael Riley was responsible for protecting the Allied fleet by monitoring the radar screens onboard a British destroyer. He came on duty at midnight. In the early morning, one blip on the screen began to cause him consternation even though, from all available evidence, there was no reason to doubt that the blip was simply another American A-6 fighter jet. However, Riley became increasingly concerned that it could be a Silkworm missile headed for the USS *Missouri*. If that ship were hit, hundreds of U.S. sailors could die. There was no clear way to figure out from the radar screen what the blip was, and because the object was moving quickly, a decision had to be made right away.

Riley gave the order to fire even though he had no rational evidence for his concern and despite the fact that if the blip really was an allied fighter jet, two innocent American pilots would die. Four hours later, the results were reported: the blip was indeed a Silkworm missile, and Riley had saved hundreds of American lives.

Why did Riley experience this reaction to a blip on a radar screen that was indistinguishable from the other blips that indicated American jets? Riley himself could not explain his anxiety, and others concluded that his decision had simply been a lucky guess. However, a cognitive psychologist decided to investigate Riley's decision-making process and revealed that the

answer lay in the timing of the appearance of the radar blip on the screen. It had appeared eight seconds earlier than the average A-6 fighter jet. Somehow, Riley had picked up on this minimal, almost unnoticeable time discrepancy.

The point of the story for me is that lived experience teaches us in ways that we are often unaware of. Sometimes, we are able to know and to understand *without explicitly recognizing and following a set of rational rules and procedures*. Riley himself was unable to give a logical explanation of his fears, even though he had intuitively recognized that something was wrong.

In fact, knowledge and reason do not consist only of *explicitly* acknowledged facts and values. Often, we operate with a non-calculative, pre-thematic understanding of the world. The notion of a *sense of place*, for instance, often arises pre-linguistically and pre-reflectively. Consequently, such revelation invites a different kind of engagement in rational decision making. Rather than simply *imposing* an apparently efficient solution with universal technical criteria, it may be more important to *discover* a way forward through a careful listening, seeing, and revealing of what is appropriate in each instance. Calculative thinking about discrete entities like roads and buildings must be supplemented by "originative" ways of thinking that decipher complex, sometimes hidden relations *between* things.[22]

When it comes to building a road, it may therefore be less important to impose solutions from above than to decipher local conditions holistically—to watch and listen carefully and to allow ourselves the opportunity to discern a sense of place. There may be instances in which, rather than razing the landscape, the road will more appropriately follow the existing topography—tracing the natural riverbed or mounting the hillside, providing unique vistas that would otherwise be lost by preserving a motorway's linear order and simply cutting through geological obstructions.

Rather than viewing the proposed road rationally "from above" in an abstract planning exercise, questions should be asked about the actual *experience* of *being* on this road once it is built. A road that meanders through a diverse landscape will *preserve the mystery* of what lies ahead. Perhaps such a road will properly waver from its direct, linear route to acknowledge and *pay heed* to a unique village or town.

A more modest planning process ensures that the natural landscape, both flora and fauna, are respectfully incorporated into the road design. A road should find its way within the *genius loci* of the local forest or mountain range. It should respect and preserve animal migratory patterns by incorporating habitat corridors.

Even road technologies can be developed differently to allow for natural drainage, which is less intrusive than traditional asphalt or concrete paving. Technologies exist for parking lots and air strips that allow grass to grow between perforated tiles and thereby permit water to pass through, preserving the environmental integrity of the landscape.[23] Presumably, these and similar technologies will provide comparable advantages in future road construction. As philosopher Robert Mugerauer wisely points out, the task is to identify ways of "fitting placement" between the social, environmental, and technological interface: "We need to let technology come into its essential forms and yet do so in ways allowing a satisfying life that spares and preserves the natural world supporting us—the world we and technology threaten to fully dominate and destroy."[24]

> "...linear approaches assume that reason is essentially a matter of scientific, ordered calculation. But "rationality" may mean more than mere calculation.

In conclusion, Jane Jacobs reminds us that "good transportation and communication are not only among the most difficult things to achieve; they are also basic necessities."[25] As we move forward to design new transportation systems and more natural cities, the challenge will be to proceed with sensitivity toward taken-for-granted values that drive decision making.[26] We should not begin the analysis by assuming that a new road is the optimal solution. Instead, we should carefully identify the true needs that are at issue and proceed carefully through an informed decision-making process. The challenge will be to make our values explicit and to collaboratively and respectfully engage in a conversation that will ensure that any intervention—road building or city building—is truly thoughtful, rather than merely technically efficient.

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NOTES

1. J. Jacobs, The Death and Life of Great American Cities (New York and Toronto: Random House, 1993), 442.

2. National Research Council, Decision Making for the Environment: Social and Behavioral Science Research Priorities (Washington, DC: National Academies Press, 2005), 27.

3. See M. Stefanovic and I.L. Stefanovic, "Decisions, Decisions," from the 2005 Proceedings of the Project Management Institute Global Congress, available at http://www.procept.com/files/Decisions_Decisions.pdf.

4. A similar set of procedures is described in A Guide to the Project Management Body of Knowledge (PMBOK Guide), 4th ed. (Newtown Square, PA: Project Management Institute, 2008). See p. 412, where problem definition is followed by phases such as defining evaluation criteria, rating pros and cons of alternatives, selecting the best solution, engaging stakeholders to gain acceptance and commitment, and evaluating solutions after implementation. See also Box 2-1, "Characteristics of an Ideal Decision Process According to Normative Decision Theory," in National Research Council, Decision-Making for the Environment, p. 28, for a strikingly similar set of procedures.

5. National Research Council, Decision-Making for the Environment, p. 25.

6. A. Lovins, "Technology Is the Answer (But What Was the Question?)" in Environmental Science, 3rd ed., ed. G. Tyler Miller (Belmont, CA: Wadsworth, 1991), 56-57.

7. Jacobs, The Death and Life of Great American Cities, 457.

8. B. Morito, "Ethics of Climate Change: Adopting an Empirical Approach to Moral Concern," Human Ecology Review, 17, no. 2 (2010): 106-116, at 112.

9. Ibid., p. 115.

10. For an executive summary of the panel's findings (where the author served as a member,) please see http://www.toronto.ca/wes/techservices/involved/wws/biosolids/pdf/brmp_peer_review_executive_summary.pdf.

11. National Research Council, Decision-Making for the Environment, p. vii.

12. C.A. Doxiadis, Ekistics: An Introduction to the Science of Human Settlements, (New York and Oxford, U.K.: Oxford University Press, 1968).

13. Most frequently, CRM is an acronym for "Crew Resource Management." For instance, see E.L. Wiener, B.G. Kanki, and R.L. Helmreich, eds., Cockpit Resource Management (San Diego, CA: Elsevier, 1993). A more recent book, J. Lehrer, How We Decide (New York: Houghton Mifflin Harcourt, 2009), refers (at p. 252 and thereafter) to "Cockpit Resource Management." The point about collaborative team decision making is, however, the same.

14. See Lehrer, How We Decide, 253-56.

15. See A. Poetz, "What's Your 'Position' on Nuclear Power? An Exploration of Conflict in Stakeholder Participation for Decision-Making about Risky Technologies," Risk, Hazards and Crisis in Public Policy 2, no. 2 (2011): article 2.

16. The case is the subject of a book by C.G. Brunk, L. Haworth, and B. Lee, Value Assumptions in Risk Assessment: A Case Study of the Alachlor Controversy (Waterloo, Canada: Wilfrid Laurier Press, 1991).

17. Ibid., p. 9.

18. Ibid., p. 26.

19. For an excellent overview of biases in risk assessment, see C. Chociolko, "The Experts Disagree: A Simple Matter of Facts Versus Values?" Alternatives Journal 21, no. 3 (1995): 19-25.

20. The story is reported in more detail in Lehrer, How We Decide, 93-97. Cf. N. Maclean, Young Men and Fire (Chicago: University of Chicago Press, 1972).

21. See Lehrer, How We Decide, p. 28ff for a full report of this incident.

22. See I.L. Stefanovic, Safeguarding Our Common Future: Rethinking Sustainable Development (Albany: State University of New York Press, 2000), for more on the difference between calculative and originative thinking.

23. See, for instance, the technology developed by the PERFO ground reinforcement system, described at http://www.perfo.co.uk/groundreinforcement.html.

24. R. Mugerauer, Interpretations on Behalf of Place (Albany: State University of New York Press, 1994) at 132, 149.

25. Jacobs, The Death and Life of Great American Cities, 442.

26. See The Natural City: Re-Envisioning the Built Environment, ed. I.L. Stefanovic and S. Scharper (Toronto, Canada: University of Toronto Press, 2012).

Reconciling Mobility: Redesigning the Road, Reweaving Landscape

By NINA-MARIE LISTER

A road is a thoroughfare designed to connect two places—a route to link communities. Virtually every definition of road implies connectivity. Yet the unintended consequence of centuries of road building has been to divide as much as to connect. In the current era of unprecedented urban expansion and road building, perhaps it's time to revisit the road and to design for connectivity, rather than fragmentation.

There are many strategies we should pursue in rethinking the road, not least the fundamental question whether to build a road. But my aim here is to pursue a set of approaches to transportation planning that focus on retaining, reclaiming, and re-establishing connectivity. We can and we should reconcile our notion of mobility such that we (re)imagine the road as a device for (re)connection between humans and wildlife, culture and nature.

Roads connect humans but they fragment the landscape, and with it, ecosystems and habitats for all species. The TransCanada Highway and the Canadian Pacific railroad compromise an essential transportation corridor running through the Bow River Valley, a critical habitat in the Rocky Mountains. Photo: Tony Clevenger, Parks Canada.

In the last sixty years, the number of cars in the United States has increased more than threefold,[1] and settlements have sprawled out from urban centers in unprecedented growth: roads have fragmented our landscapes, divided habitats, and grown ever more congested. Today, new roads are often built for the primary (but misguided) intention to alleviate congestion. Yet it's clear that more routes lead to more traffic, and inevitably to further fragmentation.[2] Divided habitat and severed landscapes degrade both nature and culture: not least, the wildlife among us.

Automobile suburbs now dominate the American landscape. Shown here is Sun City, Arizona. Source: Patricia Leigh Brown, 2004: wirednewyork.com.

Today, there are more than 4.8 million miles (7.8 million km) of roads on the continent.[3] Americans have one of the highest rates of private automobile ownership on the planet, with more than a quarter billion vehicles using these roads.[4] Given the dominance of the road in North America and the fact that we now spend, on average, 1.5 hours per day in the car,[5] it has become disturbingly commonplace—even acceptable—for wildlife to be killed on our roads. Collisions between wildlife and vehicles have increased by 50 percent in the past fifteen years. These accidents now cost Americans a staggering $8 billion every year.[6]

Collisions with deer are the most common wildlife-vehicle collision risk to human safety in the United States. Source: State Farm Insurance, http://www.statefarm.com/aboutus/_press-releases/2011/october/3/us-deer-collisions-fall.asp.

The prevalence of roadkill is an obvious and disturbing result of the conflict between the needs of humans and animals. The human need to get to where we are going safely and quickly is a basic expectation of modern society. Yet wild animals need connected landscapes: they must cross our roads in search of food, mates, and shelter. Our expanding network of roads, highways, and interchanges criss-crosses the continent, interrupting and disconnecting our landscapes—and with these, the territories of wild animals. Many are routinely struck and killed by vehicles in the most basic quest for survival.

Large mammals pose significant risks to motorists and are also themselves vulnerable where their paths cross motorways. Photo: Sandra Jacobson.

Populations of threatened, rare, and endangered species are at added risk while crossing roads to breed, feed, or migrate. Photo: Shane Macomber, Vail Daily.

But this is not merely a wilderness or rural issue—it is a problem that affects everyone; those of us living and driving in busy suburban semi-rural and urbanizing landscapes are more likely to witness or experience the conflicts first-hand.[7] In fact, growing numbers of wildlife-vehicle collisions are leading to higher levels of personal injury and property damage, and with this, rising insurance premiums. While human deaths are not high compared with other accidents, wildlife-vehicle collisions have increased significantly. A recent U.S. Federal Highway Administration study[8] reports that there are approximately one million to two million collisions between cars and large mammals every year in the United States. This represents a significant danger to human safety and to wildlife populations. Wildlife-vehicle collisions are also increasing as a proportion of the total accidents on the continent's roads.[9] Even if not physically hurt or economically affected by a collision, many people report feeling traumatized after hitting an animal.[10]

Alongside these obvious concerns for motorist safety are serious implications for wildlife. Road mortality is documented as one of the major threats to the survival of twenty-one federally listed threatened or endangered species in North America.[11] On a much larger scale, conventional road building results in significant losses of habitat for wild animals. Road networks fragment our landscapes into ever-smaller, disconnected patches in which wildlife must live and move, faced with declining genetic fitness as populations become separated and isolated. Worse yet, basic wildlife mobility often conflicts with major transportation routes. Most of North America's major highways cross the continent in an east-west orientation, but wildlife movement patterns tend to flow north-south following mountain topography, such as the Rockies, the Appalachians, and the coastal ranges. These landforms have always been important habitat and migration corridors, and they may become still more significant. Research on climate change suggests many wildlife species may be forced to migrate in changing patterns across our landscapes in search of new habitats as resources become scarce in their current home ranges.[12]

A wide variety of wildlife species are found on roads and highways that bisect their habitat. Increasingly, animals must attempt to cross busy roadways to find food, mates, shelter, and rangelands. Source: Eric Gray, Associated Press (left, alligator); Parks Canada (right, bighorn sheep).

But roadkill is not simply "bad luck" or an unfortunate consequence of driving; it's an avoidable cost and a preventable loss. If we stop and rethink our dominant model of mobility to understand that both humans and wildlife share a common need to move, we can redesign the road to provide safe passage for all.

Indeed, an emerging priority for transportation and natural resource agencies is to make highways safer for both drivers and wildlife. One of the proven solutions is to build wildlife crossing structures.[13] Also called mitigation structures, wildlife crossings include a range of built forms over and under roadways which are usually implemented in tandem with warning signs for motorists and exclusionary fencing to stream wildlife towards the structures. Deployed correctly and in the right context, wildlife crossing structures have a near-perfect success rate in preventing roadkill.

Wildlife crossing structures include both overpasses and underpasses. Source: Tony Clevenger, Parks Canada.

Exclusionary fencing and warning signage are strategies that should be used in tandem with crossing structures for a complete system of wildlife mitigation. Sources: (clockwise) OLIN, Nina-Marie Lister, Patricia White.

Wildlife underpasses and overpasses have been built and implemented in a variety of sizes and designs. While Europe has many, indeed hundreds, of wildlife crossing structures—usually referred to as "ecoducts"—North America has relatively few. The best studied and well-established overpass crossing structures are in Banff, Alberta, along the TransCanada highway in Banff National Park. However, these structures were not designed specifically for wildlife; rather, they were conventional transportation-engineered bridge structures which were adapted by adding a vegetated surface. They have proven remarkably successful in restoring ecological connectivity and in improving road safety. After a decade of study and demonstrated success, road ecologists[14] are researching new opportunities to evolve the design and function of these prototype structures by asking: could their capacities expand and the cost of their construction contract with a redesign expressly for their purpose?

Another wildlife overpass under construction in Banff, Alberta. Source: Nina-Marie Lister.

New solutions to wildlife crossing infrastructure are needed to reduce the costs and to tailor each type of crossing to the specific species in various landscape contexts. In today's climate of decreasing public investment in civic infrastructure, we are faced with an increasing need to repair existing and often crumbling transportation infrastructure; there may well be opportunities to adaptively reuse or retrofit some structures for wildlife crossing purposes, whereas new structures may test alternative and emerging sustainable materials at lower lifecycle costs. New solutions to the construction approach and material of crossing structures must also be considered in the context of long-term ecosystem change. We may need to move, enlarge, or downsize these structures based on changing wildlife movement patterns due to changes in habitats, climate, or other factors that become apparent over time.

In the broadest sense, a key step in reconciling mobility means capitalizing on the potential for crossing structures to tell a story—the story of a renewed relationship among humans, wildlife, and landscapes. In this context, wildlife crossing structures present a timely opportunity to communicate both the problems

with roads and the solutions to the general public. By making crossing structures visible, people can experience first-hand—and identify with—engineered landscape designs that create safer roads for both humans and wildlife.

Superhighways allow us to move so far and so quickly that it's possible to forget about the landscapes on either side of the road. As we extend and expand the network of roads, more motorists are moving faster through remote areas: areas that were once wilderness have become essentially urbanized. Our transportation networks have had the unintended consequence of rendering more of North America's living landscape invisible. In rethinking mobility, we ought to strive not only to reduce the number and frequency of wildlife-vehicle collisions, but to use crossing infrastructure to change the way we see and understand our roads and the places through which they travel.

Wildlife mitigation structures have the capacity to act as a new, visible layer of functioning landscape, weaving over and under highways, in and out of the natural landscape. In this way, crossing structures can reveal and highlight the landscape and habitats our road networks have fragmented; they have the potential to express this remarkably, even beautifully. Just as suspension bridges can be elegant and delicate in appearance but strong in function, wildlife crossings—whether overpasses or underpasses—can be beautiful in their simplicity while effective in linking habitats.

When designed and implemented strategically, wildlife crossing structures can radically reduce the number of collisions to save money and, most significantly, human and animal lives. Better still would be to rethink mobility at a continental scale and to redesign our transportation infrastructure to include a network of wildlife crossing overpasses and underpasses all along key migration corridors. Eventually, with an integrated network of many crossing structures in place, it may be possible to reconnect our landscapes and ultimately retain—and in some cases restore—the vital functions of North America's wild ecosystems.

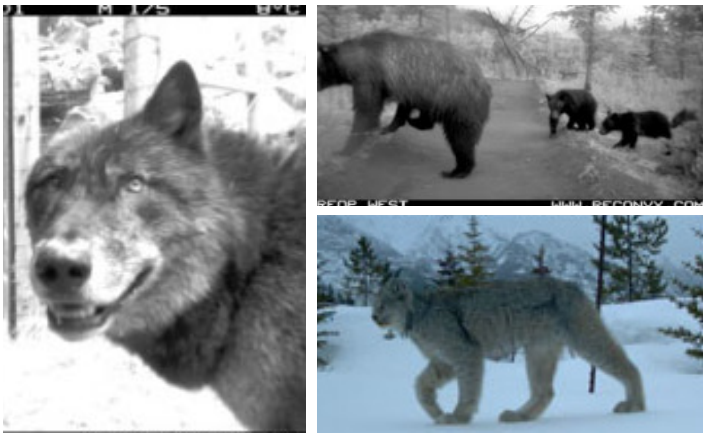
It's important to emphasize that this is not a new idea, nor is it unsubstantiated. Providing crossing infrastructure at key points along transportation corridors has been shown to improve safety, reconnect habitats, and restore wildlife movement. Throughout Europe, Asia, Australia, and North America, hundreds of crossing structures, or "ecoducts," have already been implemented with demonstrable success.[15] These include underpasses and overpasses that have been constructed in a variety of sizes and designs. Although wildlife underpasses are generally less costly to build and more commonly used by a wide diversity of species, wildlife overpasses are preferred by certain wide-roaming and iconic species-at-risk, such as lynx, grizzly bears, and wolverines, for example. Overpass structures are also more visible and noteworthy to motorists, which suggests that these structures may have the potential to engage the public in ways that advance conservation education, landscape awareness, and environmental literacy.

A European ecoduct, one of more than fifty similar structures in the Netherlands. Source: Henri Cormont, RWS.

In terms of structural engineering, wildlife overpasses are the reverse of most conventional bridges. This has implications for how they are designed and the materials from which they can be made. Conventional vehicular bridges are typically longer in span than width; that is, they are narrow enough to accommodate maybe two to four lanes of traffic but may have a long span to cross a river, a highway, or a harbor. Wildlife bridges are typically shorter in span but much wider. They also necessarily include a thick layer of soil and vegetation—a landscaped surface—that must emulate local habitats. This means that crossing structures could be designed differently from conventional bridge structures. They might include lighter, flexible, and more adaptive materials or a system of construction that is modular or even dynamic.

Each of these innovations has the potential to result in more sustainable and affordable construction. For example, an adaptable, modular structure can also expand, contract, or be moved to respond to changing habitats and climate conditions that are difficult to predict. As a new category of infrastructure, wildlife crossings are an opportunity to explore new materials, features, and approaches to building and construction. This exploration is important, given the diversity of habitats and wildlife species that must be accommodated affordably and safely.

In 2010, the ARC International Wildlife Crossing Infrastructure Design Competition16 was launched to explore new materials, new methods, and new thinking about wildlife crossing infrastructure. The ARC competition engaged the world's leading engineers, landscape architects, and ecologists to create the next generation of wildlife crossing infrastructure for North America's roadways. Designers were challenged to develop new solutions for animal road-crossing structures that would be cost-efficient, ecologically responsive, safe, and flexible; they developed concept solutions that could be readily adapted for widespread use in various locations and under many conditions, including climate change. As such, the ARC competition was an opportunity to investigate and propose a range of new solutions to the problem of congested roads, fragmented habitat, and vehicle-wildlife collisions.



A wide variety of wildlife has been recorded by motion-triggered cameras at overpass and underpass structures in the Banff area, including a rare sighting of a Canada Lynx. Source: Tony Clevenger and Parks Canada.

Based on state-of-the-art engineering and the best available data in road ecology, the ARC competition advocated for a set of best practices in considering wildlife overpass structures. The competition began with the basic premise that any crossing design must be safe for humans and wildlife alike, but it must also demonstrate other important functions and benefits. In particular, crossing structures must be cost-effective in terms of materials, construction, and maintenance, while also ensuring ecological responsiveness to current and anticipated conditions—yet structures should also be flexible or modular for possible use in other locations, and ideally, they should be adaptive, to facilitate mobility of wildlife under dynamic ecosystem conditions. An important criterion to advance the design of crossing structures is that they must be sustainable in terms of materials and energy use and responsive to climate change. Well-designed and properly planned structures must also have an important civic value: they must be educational, revelatory, and communicative to the public, and therefore, they ought to be beautiful, engaging, and remarkable. From a pragmatic perspective, new solutions for crossing structures should be considered as early as possible in the transportation planning process so as to ensure context-specific design for target species.

In the context of these criteria set out by the ARC competition, wildlife crossing structures represent a new category of infrastructure for designers, engineers, and scientists. As such, they require a collaborative, interdisciplinary systemic approach for effective planning and design. Yet highway engineering and transportation planning have traditionally been highly compartmentalized activities in which various experts work separately on distinct aspects of a project. Wildlife crossing infrastructure cannot be planned this way for the simple reason that there is more than one "client" for the project. Both humans and animals have different (and sometimes competing) needs related to any given crossing structure; some species prefer overpasses, while others prefer underpasses. All require safety.

Resolving such a design challenge requires more creativity and expertise than any one specialist affords. For this reason, wildlife infrastructure design is necessarily a collaborative craft, one that requires the input of many different types of experts, from ecologists to architects to landscape designers to engineers and transportation specialists. Road ecologists who study and understand animal interactions with highways must work proactively with the federal agencies and state departments of transportation that are responsible for everything from planning and engineering the roads to handling collision emergencies and cleaning up roadkill. The ARC project provided a proactive opportunity for these and other related experts to come together and collaborate in designing a new approach to wildlife and human safety.

Five finalist teams in the ARC International Design Competition were short-listed from a field of more than one hundred firms participating on thirty-two qualifying entrant teams from nine countries.[17] The finalist teams advanced a variety of strategies, materials, and design concepts for a new kind of mobility for

both humans and wildlife. Their creative, collaborative, and interdisciplinary design processes resulted in an innovative range of ideas. Some of the key advances in crossing design and rethinking mobility from a landscape scale included:

Diversity of building materials. Concept designs employ a wide diversity of building materials, including glued laminated timber, steel, Ductal concrete (which is more compressive and resistant), glass-reinforced plastic, and wood-core fiberglass, as well as more innovative usage of everyday materials such as precast concrete.

Layered construction techniques. Designs incorporate layered construction techniques—for example, using stacked convex and concave "arcs" or steel lattice with modular landscape inserts.

Shape. Concept designs are based on an inverted arc shape, which conveys the feeling of a valley for animals and results in more light for drivers and the roadway; pillar-free designs improve highway safety.

Viewing platforms for the public. These range from highway pullouts at a safe distance to a "periscope" for discreet observation that is integrated into the bridge structure.

Explorations of modularity. Some concepts extend the crossing span or width through landscaped ramps or a structural system of pieces that appear to snap together. Another concept is based on pre-fabricated, pre-vegetated habitat modules that respond to local conditions. In all cases, modules can be added or removed as needed and can be switched out if local habitat conditions change. Modular designs and flexible structural solutions ensure efficient construction that saves time and is easy to build without highway closures, or with limited interruption of traffic.

Monitoring of wildlife. Designs accommodate real-time monitoring of wildlife movement for both scientific and public educational purposes through various features. These include placement of cameras on the bridge that will download images to smartphone apps, websites, information kiosks, or local schools. Monitoring strategies are designed to permit adaptive management of vegetation and habitat—and in several cases, adaptation of the structure itself.

Through these concepts, the five finalist designs in the ARC competition offer tangible examples of how we might reconcile mobility for both humans and animals, in various contexts and circumstances. Each of the concept designs is profiled briefly here to illustrate the innovation and advances in design thinking and practice for this new typology of infrastructure.

Finalists in the ARC International Design Competition

Modular Crossing System, by Balmori Associates.

The goal of this design is to create a modular and efficient "kit of parts" using sustainable materials. To achieve this, the design strategy specifies using locally manufactured, laminated timber girders made from timbers killed by the pine beetle. The resulting bridge is a sustainable free-form structure that stores more CO_2 than was used in the manufacturing process. The topography of the local landscape is reflected in the underside contours of the structure, while the surface habitat, with its wide ramps, is designed to blend seamlessly into the surrounding landscape.

Wild X-ing, by OLIN.

Wild X-ing

The goal of this design is to create a modular structure that can be locally assembled and adapted as habitats change. To achieve this, the design strategy creates a double-curved inverted arc structure, composed of a steel and Ductal grid overlaid with a rhomboid-shaped micro-grid lattice. The lattice is composed of pre-vegetated, lightweight, glass-reinforced plastic habitat modules—inserts that can be adapted, replanted, replaced ,or expanded as conditions dictate. Customized to local habitat conditions, the modules can be planted off-site and readily transported by flatbed trailer to the site for insertion or replacement.

RED, by Janet Rosenberg & Associates

RED/Research Evolve Design

The design goal for this concept is to build a lightweight, flexible structure that is iconic, yet almost invisible. To achieve this, the design strategy uses lightweight, resilient wood-core fiberglass for the bridge structure, which is designed in flexible, modular configurations, or "strands," in the landscape. This strategy makes use of the existing tree canopy as additional habitat between strands and proposes multiple connections into the site with varied possible routes across the bridge, based on the travel habits and preferences of each target species. Notably, the bright red bridge is intended to be an iconic structure for humans, signifying the crossing, the landscape, and its non-human inhabitants, but is unremarkable to wildlife that cannot see the color red.

Landshape, by Zwarts & Jansma Architects.

Landshape

The goal of this scheme is to create a cost-effective, lightweight, pillar-free structure that appears to float across the highway. To achieve this, the design strategy involves using concrete formwork to create a thin-shell, double-curved, pillar-less structure. The formwork can be reused many times and results in a cost-effective structure due to the thin layer of concrete required and the intention of repetitive construction to create a series of bridges. The upper curve of the "landshape" contains the habitat for the crossing, including a system of ponds to serve as a draw for wildlife.

Hypar-Nature, by HNTB with Michael Van Valkenburgh Associates.

Hypar-Nature

The design goal for the winning design in the ARC competition is to develop a sustainable, modular, flexible, cost-effective crossing system that appears to weave over and under the road and that can be made locally and assembled on site. To achieve this, the design strategy employs thin-shell, precast concrete forms based on a three-hinged arch. These hypar-forms allow for minimal site disturbance and relatively easy on-site assembly and deployment, given the widespread availability of local precasting facilities across North America. The hypar-forms can be readily expanded or adapted as wildlife movements and habitats change or as site-specific conditions dictate. The scheme is a landscape and structural collaboration, bridging both under and over the road, effectively layering both the drivers' experiences and animals' preferences.

Although the ARC project began with a competition for a specific location near Vail, Colorado, it's important to emphasize that the only way to solve the problem of vehicle-wildlife collisions for good—and to truly reconcile mobility—is to have a system of crossing structures, including overpasses and underpasses, bridges and tunnels. No single structure alone will solve more than a localized problem; wildlife crossings must become a ubiquitous part of the North American roadscape if they are to be successful on a landscape scale. To do this, an adaptable, flexible, and modular design is needed—one that can be readily modified to different contexts and circumstances.

One of the simplest and most elegant ways to begin this infrastructural transformation is to first use everyday materials that are readily available, but to use these materials in an uncommon and modular way. This is precisely what the winning team in the ARC competition proposed (see Hypar-Nature in the adjacent box). Designed by HNTB with Michael Van Valkenburgh Associates Inc., the winning concept for the ARC competition demonstrates how a reliable, predicable, and proven material can be deployed in an uncommon or novel way. Precast concrete is one of the most common building materials in North America, meaning that every state has the capability to make it, and no location in the United States is more than 250 miles (400 km) from a fabricating plant. Although concrete is not considered a sustainable material, there are improvements being made in its composition. Precast concrete is readily available to use on a large scale, in many locations, which lowers the production cost for the crossing structures.

The ARC competition's winning design is only one example of the innovation needed for new solutions for wildlife crossings. The HNTB+MVVA scheme uses ordinary materials and technology, as well as construction techniques that are well established and, in particular, accessible in many locations across the continent. This has significant potential to reduce construction costs and improve construction accessibility. This solution combines emphases on wildlife habitat, behavior, and viability, with a practical intelligence and concern for long-term sustainability. The ARC jury noted in particular that this scheme "*marries well a simple elegance with a brute force. It effectively recasts ordinary materials and methods of construction into a potentially transcendent work of design. In this regard it gives us confidence that it could be credibly imagined as a regional infrastructure across the inter-mountain west.*"[18]

As more crossings are built, continuous learning through ongoing monitoring is expected. Wildlife crossings are being designed as living experiments, complete with data-gathering technologies built into the structure. The crossing infrastructures offer rich potential for learning: infrared cameras installed at crossing sites capture and record animals in transit; Web cams transmit real-time wildlife movement data to science labs and classrooms alike; and hand-held applications bring the data to passengers in a passing car. From scientist to student to tourist, wildlife crossings reconnect us all to the landscapes that surround us, and in so doing, have the capacity to improve environmental awareness and engage a new culture of ecological literacy and practical conservation.

Wildlife crossing locations and structures are already monitored by scientists and citizens' groups using motion-triggered and infra-red cameras to track wildlife movement and public sightings of wildlife on roads. These data could be shared more broadly using websites and handheld applications made accessible to schools, zoos, and conservation groups to improve public awareness, environmental education, and ecological literacy. Sources: Russ Sands (left) and HNTB + MVVA (right).

In turn, the design of future crossing structures will improve. Based on the lessons learned from the monitoring data gathered, structural designs can and should be adapted to the site conditions and wildlife dynamics with each successive implementation. Over time, we can expect more of the radical and prototypical designs advanced by the ARC competition, along with other innovations in materiality, technology, and ecological approaches. These new solutions will be welcome additions to what is already a promising new category of infrastructure.

Over time, as wildlife crossing structures become more commonplace, the public sector may be more willing to take risks with new materials and embrace more experimentation in different contexts and applications. In the immediate future, the ARC project goal[19] is to see a variety of prototypical structures built and to demonstrate to state and federal agencies and to the public at large that these crossings work on a larger scale. They will reduce animal-vehicle collisions by between 80 to 100 percent if designed correctly; with time, wildlife crossings can eliminate the problem and the cost of such collisions.

Clearly, modern highway design must meet many different needs. The ARC project has demonstrated that it is possible to design not only successful crossing structures, but also a process that meets the diversity of today's transportation needs. In particular, the ARC project has already made considerable progress toward the (re)design of highways to maintain the integrity and connectivity of our ecosystems, reduce the carbon footprint, minimize the consumption of non-renewable materials, recycle resources, and extend the life cycle of transportation infrastructure—all while providing safe and efficient mobility for humans and wildlife. But we know that single, iconic bridges will not accomplish much. To be effective at the most functional level, we need a network of crossings—what some have called "an interstate for wildlife"[20]—just as highways are a network of roads.

By redesigning the road for two "clients"—animal and human—wildlife crossing infrastructure presents a timely opportunity to communicate both the problem and the solution to the public. In building crossing structures that are visible and legible, we may empower motorists to experience engineered landscape designs that create safer roads, while simultaneously demonstrating the importance of (re)connected landscapes. Widespread deployment of this relatively simple redesign tactic may change the way we move and live, and with this, change the dominant model of mobility.

We have proven solutions to reweave our landscapes, protect our wildlife populations and their habitats, and ultimately restore the essential functions of North America's wild ecosystems. In redesigning the road for safe passage for all, we take one of many steps to honor the landscapes that sustain us and the places we call home. It's time to reconcile mobility and redesign the road.

Reconnecting our landscapes with safe passage for all. Source: Yves Leblanc.

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REVIEWS & REFLECTIONS

BRINGING PEOPLE TOGETHER OR KEEPING THEM APART: THE SPATIAL CONFIGURATION OF ROADS AND OTHER PATHWAYS

By David Seamon

One of the most significant dimensions of roads and other pathways was not well understood until the early 1980s when British architectural thinker Bill Hillier developed a theory called space syntax.[1] Hillier argued that the particular spatial arrangement of pathways—whether roads, streets, sidewalks, or building corridors—plays a major role in whether those pathways are well used and animated or empty and lifeless. His work demonstrated convincingly that different pathway configurations can bring users together spatially or keep them apart.

One central concept in Hillier's theory is *axial space*, which relates to the *one*-dimensional qualities of a pathway and has bearing on human movement through a settlement or region as a whole. Axial spaces are illustrated most perfectly by long narrow streets. They can be represented geometrically by the longest straight line that can be drawn through a street or other movement space before that line strikes a building, wall, or some other material object. Axial lines are significant for at least two reasons. First, because they indicate the farthest point of sight from where one happens to be, axial lines speak to the lived relationship between "here" and "there" and thus, at the settlement scale, have bearing on environmental orientation and finding one's way in a place. Second, because they collectively delineate the spatial system through which the various parts of a place are connected by pedestrian and vehicular circulation, a settlement or region's web of axial lines provides a simplified rendition of the potential movement field of a place. Hillier's important discovery was that differently configured pathway webs play a major role in generating different patterns of pathway movement and face-to-face encounter among pedestrians and other users.

An important quantitative measure in regard to axial spaces and pathway webs is *integration*, which Hillier defined as a measure of the relative degree of connectedness that a particular axial space has in relation to all other axial spaces in a particular pathway system. The assumption is that a pathway connected to many other pathways will be more traveled because users will need to traverse that pathway to get to other pathways and destinations in the settlement or region. Such a pathway is said to be strongly *integrated* in the movement field because many other pathways run into that well-connected pathway and potentially provide a large pool of users. In contrast, a *segregated* pathway

About the Cover Image of Minding Nature 5.1

In this axial map of central London generated by numerical integration values, the reddest lines represent the most integrated pathways and thus the streets of most pedestrian movement. The long red line running almost horizontally from central left is Oxford Street, said to be one of the world's most heavily used streets by pedestrians. Note the yellow, orange, and red lines form rough "deformed wheels" indicating important London neighborhoods like Soho or The City. In turn, these small "wheels" weave themselves into a larger city web that allows for a great degree of permeability and ease of movement with and between neighborhoods and districts. The blue and indigo lines indicate pathways much less integrated into London's pathway system and thus streets of much less movement.

—David Seamon

REVIEWS & REFLECTIONS

has few or no other pathways running into it—for example, a dead-end street. All other things being equal, a segregated pathway will be the locus of less movement, since it serves a more limited number of users in its immediate vicinity only.

Through integration and other quantitative measures, Hillier developed a compelling understanding of the *global* pattern of a place—in other words, the way the particular spatial configuration of a place's pathway fabric lays out a potential movement field that draws people together or keeps them apart. *Natural movement* is the term Hillier used to describe the potential power of the pathway network to automatically stymie or facilitate movement and the face-to-face interactions of pedestrians and other place users—for example, merchants, workers, and residents from shops, workplaces, and dwellings along the streets. With many people present involved in their own regular routines and activities, the result typically is animated pathways and exuberant local places. Hillier recognized that other place elements like density, building types, and number, size, and range of functions and land uses also contribute to place vitality, but he argued that, ultimately, pathway configuration is most primary and most crucial.[2]

In regard to cities, Hillier demonstrated that most urban pathway systems have traditionally been an integrated, interconnected fabric of variously-scaled *deformed grids*—pathway systems in which the most active, integrated streets make a shape that roughly suggests a wheel of rim, hub, and spokes. Typically, each of these deformed grids is associated with some designated neighborhood or district—for example, London's Soho, West End, or City (see box on the preceding page). In turn, the integrated pathway structure of these districts join together to shape a much larger *deformed grid* that founds the movement dynamic of the city and London region as a whole. Hillier pointed out that twentieth century urban design and planning regularly replaced integrated pathway configurations with treelike systems of segregated pathways that stymied or destroyed the intimate relationship between local and global integration and thereby eliminated much face-to-face interaction—for example, the "cul-de-sac and loop" pattern of low-density, automobile-dependent suburbs or the hierarchical circulation layouts of many modernist housing estates.

For future environmental design and policy, Hillier's critique of modernist planning suggests that the possibility of individuals readily gathering in face-to-face encounter is greatly compromised because the particular pathway configuration does not channel the movements of many people into and along more integrated pathways. In other words, modernist pathway structure regularly separates pathway users rather than bringing them together, face to face, through an integrated pathway network of sidewalks, streets, and roads. Users that otherwise might feel a sense of spatial community—a situation that the deformed grid readily affords—remain apart spatially and environmentally. They do not as readily meet in the course of a daily life grounded in place regularity and routine. There is much less chance for what humanistic geographer Yi-Fu Tuan termed *fields of care*—places that comes to be known affectionately through recurring, serendipitous, face-to-face meetings and experiences.[3]

David Seamon is a Professor of Architecture at Kansas State University in Manhattan, Kansas. Trained in geography and environment-behavior research, he is interested in a phenomenological approach to place, architecture, and environmental design as place making.

NOTES

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REVIEWS & REFLECTIONS

PLACE RE-IMAGINED

By Juliana DeVries

Few things capture the romantic imagination like the great cities of the world. In New York, I find myself transported on a stroll through Central Park by the tune of a saxophone. This is what it means to be a New Yorker, I think to myself with pride, as I sit down on the Great Lawn with my Sunday crossword. But the imagination—a lovely device at times—can obscure truth.

In her book *World City,* Doreen Massey is a creative debunker of geographical imaginaries, and her subject is London. Former London Mayor Ken Livingstone once sang London's praises as a "world city" to which immigrants come from all over, allegedly in order to enjoy the freedoms the city has to offer. Massey points out how this conception involves multiple implicit assumptions. For example, it seems to refer to a place outside history, so that London is a distinct something that pre-exists the immigration it attracts; and it assumes that the immigration is fully voluntary and positive, as if London's economic and cultural influence does not negatively affect other regions, so that many immigrants have little choice but to move to cities like London that dislodge and dislocate as much as they attract. Livingstone assumes that London is actually successful, but the very criteria of success are debatable because they rest on assumptions such as these.

Massey argues that challenging these assumptions is both necessary and exigent. We must uncover and re-think our geographical conception of London, as well as our conceptions of all world cities as they exist today, because these imaginaries prevent us from building a just world. By uncovering and rethinking our geographical imaginaries, we can begin to overcome the vast inequalities present within our global cities and between those cities and other parts of the world. With more people now living in cities than not, in a world where vast inequalities have set off global Occupy protests, Massey's book is urgently relevant today.

As we ask ourselves, what does it mean to be of this place? or what does this place stand for? we have to also ask what are our responsibilities as members of this place? These are not new questions, but in our globalized world, they need new answers. As the influence of global cities reaches far and wide, what it means to be of a place and our resulting responsibilities also begin to extend beyond traditional borders.

World cities not only include the territorial space of the city limits as it has been historically defined. We must also consider how the city interacts with other places that we might normally think of as separate. "In considering the politics and practices, and the very character, of this place, it is necessary to follow also the lines of its engagement elsewhere" (p. 13). Massey hopes to create a "politics of place beyond place" (p. 15) that is both "territorially grounded" and yet "responsive to a relational space" (p. 156). Then, in extending the geographical imaginary of a place, we also extend the reach of our responsibilities.

A review of Doreen Massey, World City (Malden MA: Polity Press, 2007)

Massey has written about her global conception of place in previous works, although not as extensively as in *World City*, where she details her theory. For example, she specifies that we should be careful not to "blame the victim." Blaming the victim would be, for example, when regions of the United Kingdom outside London are blamed for their own failures, when those shortcomings might be the result of specific policies that benefit London. At the same time, Massey investigates what she sees as a dangerous trend of fetishizing the local.

REVIEWS & REFLECTIONS

Massey also focuses more in this work on the specific case of London. She uses the London case to show how rethinking the geographical imaginary of a place might look in terms of actual policy decisions. Her stated goals include not only "expos[ing] the hegemonic geographical imaginations" but also "tak[ing] the further step of proposing alternatives" (p. 24). Massey has succeeded in accomplishing this task for London. But we all now must relate these notions to our own places of residence. As one who lives in New York City, I wonder how we might apply Massey's world city theory to it? In other words: what does it mean to be a New Yorker? What are our responsibilities as New Yorkers?

Taking on a study similar to Massey's to answer these questions for New York would require extensive research. I am no expert on the geographical assumptions of New York politics, though I believe this would be a valuable undertaking. What is clear is that many of New York's problems also seem to come back to geographic assumptions—on issues such as eminent domain or gentrification, for example.

World City is also valuable to New Yorkers and other non-Londoners because it reminds us of how important conceptions of place and its meaning are to our politics, a fact often forgotten. This fall I spent time protesting with Occupy Wall Street in Lower Manhattan. I remember attending a talk at Zuccotti Park where a dozen of us or so argued for hours about how our political system could possibly handle the ecological crisis. We were only a few small individuals, flanked by the tall buildings of Lower Manhattan, but I felt endowed with a power and a need to raise my voice loud for politics. I think there was something about the park, about having a place, which contributed to this strength and confidence.

It was through OWS that I first came across Doreen Massey, as well. Massey was among the speakers at St. Paul's Cathedral as part of Occupy London's Free University. This seems a fitting association to me, as the Occupy movement also works to reclaim places from hegemonic actors, creating a politics that is both grounded and yet connected to a global web. There is a certain beauty to the thought of Massey presenting her ideas in the context of this movement, to think of her words floating up into the highest chambers of St. Paul's Cathedral.

Unfortunately, the speech Massey gave at Occupy London was not recorded. However, I recommend *World City*, to all those concerned with global inequality and the future of an ethics of place.

Juliana DeVries is a young writer living in New York and a former intern at the Center for Humans and Nature. She now works as a research/editorial assistant for Harvey A. Silverglate, a criminal defense and civil liberties litigator, and plans to attend law school in the near future.

REVIEWS & REFLECTIONS

CHN BOOKSHELF

A regular feature calling attention to important books and articles that CHN staff, board, and collaborating scholars are reading and recommend. *Quot libros, quam breve tempus.*

G. M. Burghardt, The Genesis of Animal Play: Testing the Limits. (MIT Press, 2005).

D. E. Cooper, Convergence with Nature: A Daoist Perspective. (Green Books, 2012).

R. De Young and T. Princen, eds., The Localization Reader: Adapting to the Coming Downshift (MIT Press, 2012).

P. Hawken, Blessed Unrest. (Penguin 2008).

C. Parenti, Tropic of Chaos: Climate Change and the New Geography of Violence. (Nation Books, 2011).

R. Scruton, Green Philosophy: How to Think Seriously About the Planet (Atlantic Books, 2012).

P. Victor, Managing Without Growth: Slower by Design, Not Disaster. (Edward Elgar, 2008).

THE LAST WORD

EMBRACING THE CALL FOR A NEW CIVIC DISCOURSE

FOR SOME TIME NOW, IT HAS BEEN DIF-ficult to remain hopeful about the trajectory of American civic life. While our world continues to face unparalleled socio-ecological and economic challenges, our governing leaders have proved incapable of addressing these crises in meaningful ways. In their recent book, *Gardens of Democracy*, Eric Liu and Nick Hanauer take on the worthwhile task of attempting to salvage a civic discourse out of this rubble of modern politics. Within the realm of civic life, Liu and Hanauer conceive of a vision for citizenship that affirms self-interest is best served through mutual interest; within the realm of political life, Liu and Hanauer articulate a vision for government that affirms the role of public life in addressing our great challenges, yet draws upon citizens and individuals to achieve these aspirations. Although adumbrative by its nature, this small but worthwhile book deposits a rich loam where the seeds of a new discourse about citizenship, economy, and government may encourage profound responses to the socio-ecological crises and challenges we face.

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For Liu and Hanauer, modern political discourse adheres to a worldview they label "Machinebrain." Machinebrain conceives of the world as static, stable, reductionist, and self-regulating. "Machinebrain," Liu and Hanauer argue, "sees the world and democracy as a series of mechanisms—clocks and gears, perpetual motion machines, balances and counterbalances . . . Machinebrain presupposes stability and predictability, and only grudgingly admits the need for correction. Even the word commonly used for such correction—'regulation'—is mechanical in origin and regrettable in connotation. . . . It is a static mindset of control and fixity, and is the basis of most of our inherited institutions, from schools to corporations to prisons."[1]

Arguing that Machinebrain arises from a vestigial Enlightenment worldview, Liu and Hanauer recognize that all political and civic worldviews stem from a constructed narrative. In this way, we "*construct* a social reality that validates some truths and distorts others. . . . [This constructed reality] defines what a society thinks is possible."[2] Drawing upon advances in biology, physics, neuroscience, psychology, economics, and other fields, Liu and Hanauer argue that the worldview of Machinebrain is based upon notions that the natural and social sciences have long dismissed. Where we once could see only reducible phyla, we now recognize the immense, overwhelming complexity of systems. Where we once revered the atomistic individual, we are now only beginning to understand the intricate lattices of the networks that connect us to other humans, our communities, and our natural world. Where we once assumed that competition and selfish individualism promised prosperity, we now recognize that true self-interest can only be achieved by recognizing the ways in which we can all suc-

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THE LAST WORD

ceed together. These developments have resulted in a revelatory social and ecological narrative—yet Liu and Hanauer rightly point out that our civic worldview has failed to recognize and embrace these new narratives.

Taking up the task of constructing a worldview that accounts for and embraces this new social reality, Liu and Hanauer prescribe a perspective that they label—in contrast to Machinebrain—as Gardenbrain. For Liu and Hanauer, "Gardenbrain sees the world and democracy as an entwined set of ecosystems. . . . To be a gardener is not to let nature take its course; it is to *tend*."[3]

Liu and Hanauer draw upon Gardenbrain's recognition of the entwined nature of ecosystems to call for a renewed understanding of citizenship that embraces and understands the value of that connectivity. From the perspective of Gardenbrain, citizens are expected to tend gardens together—recognizing that the actions of each individual influence and affect the outcomes for others. It's no longer enough to decry malevolent outcomes; instead of ignoring challenges that once seemed remote, Gardenbrain citizens must embrace challenges that are remarkable for both their importance and immediacy.

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However, while Gardenbrain commits a citizen to new responsibilities, Gardenbrain thinking also empowers citizens. According to Liu and Hanauer, Gardenbrain "enables us to claim more individual power—much more power than conventional theories of citizenship attribute to us as individuals. For one of the central facts of life on an interdependent web is that every action and omission is potentially powerfully contagious."[4]

However, while each individual citizen has the power to have a "contagious" influence on other citizens—for good or ill—there's little guarantee that the citizenry will have access to the resources that optimize this empowerment. For the Gardenbrain citizen to function effectively and most beneficially, that citizen must have democratic access to the questions and ideas that help a citizen identify her responsibilities and commitments to herself, her community, and her world. This democratic access can take many forms; indeed, a robust marketplace of these ideas will help an able citizen cull perspectives and ethics that are descriptively and normatively superlative.

Recognizing the need for an invigorated resource, the Center for Humans and Nature is preparing to launch a new web portal this spring that can empower citizens by helping them identify responsibilities and commitments to self, community, and the world. Through this resource, the Center posits questions that are key to citizenship, asks experts and scholars from around the world to respond in an accessible format, and then invites all individuals to consider the materials, develop ideas of their own, and join in this civic conversation. Such a resource, premised on the belief that democratic discourse will

THE LAST WORD

shape our future, empowers the citizen to maximize his or her civic talent.

I believe that Liu and Hanauer are correct: we are more connected than we ever thought possible. This interdependence requires that we pay attention to those things which once might have seemed peripheral, yet also grants us the profound privilege to lead a civic life that will transform ourselves, our communities, and our world in ways unforeseen and unimagined. Yet a new civic life compels us to consistently seek new ideas and perspectives—and demands that we nourish personal and civic growth in ways that empower us even as narratives and worldviews transform. And as we identify our commitments, we will need to seek out civic opportunities at all levels and in all spaces to live out those responsibilities. Civic life must permeate our daily actions and routines. For the Gardenbrain citizen, no step is too small, no act too mundane.

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NOTES

1. E. Liu and N. Hanauer, The Gardens of Democracy: The New American Story of Citizenship, the Economy, and the Role of Government (Seattle, WA: Sasquatch, 2011), at 10-11.
2. Ibid., at 8.
3. Ibid., at 11.
4. Ibid., at 54.

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