Ecology and Ethics 1

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Linking Ecology and Ethics for a Changing World

Values, Philosophy, and Action

Springer

Ecology and Ethics

Volume 1

Ecology and Ethics

This series is devoted to continuing research at the interfaces of ecology and ethics (embedded in the multiple fields of philosophy and ecology) to broaden our conceptual and practical frameworks in this transdisciplinary field. Confronted with global environmental change, the academic community still labors under a tradition of strong disciplinary dissociation that hinders the integration of ecological understanding and ethical values to comprehensively address the complexities of current socio-ecological problems. During the 1990s and 2000s, a transdisciplinary integration of ecology with social disciplines, especially economics, has been institutionalized via interdisciplinary societies, research programs, and mainstream journals. Work at this interface has produced novel techniques and protocols for assessing monetary values of biodiversity and ecosystem services, as illustrated by the Millennium Ecosystem Assessment. At the beginning of the 2010s, however, an equivalent integration between ecology and philosophy still remains elusive. This series undertakes the task to develop crucial theoretical and practical linkages between ecology and ethics through interdisciplinary, international, collaborative teamwork. It aims to establish a new forum and research platform to work on this vital, but until now insufficiently researched intersection between the descriptive and normative domains. The scope of this series is to facilitate the exploration of sustainable and just ways of co-inhabitation among diverse humans, and among humans and other-than-human co-inhabitants with whom we share our heterogeneous planet. It will address topics integrating the multiple fields of philosophy and ecology such as biocultural homogenization, Planetary or Earth Stewardship.

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Foreword

Living on Earth, we need to figure out who we are, where we are, and what we ought to do. "The unexamined life is not worth living" (*Apology*, 38). The classic search has been to figure out what it means to be human. Socrates, however, was sometimes wrong. Socrates loved Athens. We live in towns; humans are "political animals" (Greek: *polis*, "town;" Aristotle, *Politics* 1. 2). Cultures shape our humanity. But Socrates avoided nature, thinking it profitless. "You see, I am fond of learning. Now the country places and trees won't teach me anything, and the people in the city do" (*Phaedrus*, 230d).

I have claimed to be wiser than Socrates. "Life in an unexamined world is not worthy living either." Humans, the only species capable of enjoying culture, are also the only species capable of enjoying the splendid panorama of life. In the pages that follow, my more inclusive conviction is endorsed, fortunately, by over 40 contributors sharing their accounts, of living well in place, combining nature and culture, residing on landscapes: "Rozzi's biocultural ethics." "The inclusive ecosystem recognizes humans as components" (Pickett). Nadkarni shows how "ecologists might bring the 'humanist' aspects of their work to provide more compelling arguments to connect humans with nature to help solve environmental problems." The reader can look forward to diverse spiraling around this common theme.

This requires examining as Meine says following Leopold, "these spheres—what we know from science, what we do in practice, what we value and believe through our philosophies, and how we govern ourselves." The conclusions of this array of scholars and activists agree with another of my claims, that abundant living requires a deep sense of place in three dimensions—the rural, urban, and wild. Otherwise we will be one-dimensional persons, under-privileged. Here is a strong sense of "inhabiting" landscapes, not just as citizens but as residents, not just supported by ecosystem services, but of dwelling in one's country, and co-dwelling with the larger community of life, even of spiritual ties to a landscape.

These spiritual (or religious, or deeper philosophical) dimensions are found here often—as with Chapin and his co-authors examining the Alaskan indigenous peoples, or Cafaro recalling Carson's reverence for life, or Sideris and her sensitivity

to ecospirituality in classical traditions. Religious values appear again in Nadkarni's surveys of how urban people value nature. Mallory exposes the errors in the view "that nature is something out there, removed, displaced from the social and cultural dwelling places of people and the sites of human community … fundamentally irrelevant to human problems of inequality and injustice." We conserve our landscapes, and that includes "linking ecology and ethics for a transition to the sustainable city" (Pincetl).

People and their landscape "co-constitute" each other. In the sense that we humans are searching for our appropriate behavior on landscapes, as Hayward develops, "there is always, and inevitably, some 'anthropocentrism' at the heart of environmental ethics." We need living on a landscape with "environmental imagination," as Klaver sees it, even with urban Texans engaging surroundings more grey than green, "being in, or being with" hodgepodge slices of nature/culture. Pincetl envisions how Los Angeles could become much greener than it is, and at the same time more equitable in its opportunities for those who live there to experience nature—green, grey, or brown. This requires resisting the "homogenization" (the "McDonalization") of both culture and nature, and insisting on regional distinctiveness. We heed Rachel Carson's "warnings concerning the increased artificiality and simplification of the landscape" (recalled by Cafaro).

This two way people-nature interchange is a repeated focus here, about which there is both welcome and warning. "Biogeochemistry + anthrogeochemistry = novel world." Naeem knows that humans require their "ecosystem services," but, should this become simply an anthropocentric concern for human benefits in a future world, he is also apprehensive: "Is a planet servicing one species likely to function?"

We need, repeatedly, as Meine contends, "Leopold's special contribution as a defining moment in the discourse connecting conservation science, ethics, policy, and practice. That discourse continues, especially in emerging interdisciplinary fields, even as our critical environmental concerns make the need for integrated thinking ever more apparent and immediate." Leopold already saw in the last century what has become central on our agenda in the new millennium: We live, "I think, at what might be called the standard paradox of the twentieth century: our tools are better than we are, and grow better faster than we do. They suffice to crack the atom, to command the tides. But they do not suffice for the oldest task in human history: to live on a piece of land without spoiling it."

Callicott, following Leopold, opens up his project of "world view remediation," concluding with some uncertainty: "Is there anything that can be characterized as an ecological worldview? And, if so, in what does it consist? Does ecology, that is, provide us with a conceptual framework that functions as a lens through which our sensory experience is classified and organized to form a coherent whole, an ecological worldview?"

Pickett recalls "the changes that ecological paradigms have undergone" and addresses some of the issues that bother Callicott: "the flux of nature: changing worldviews and inclusive concepts." Pickett replies: "What matters most, as embodied in the new paradigm, is the underlying resilience of ecological systems, the degree to which they can adjust to new opportunities or adapt to changing situations."

A feature that contributes to such resilience, according to Wu, is their hierarchical structure. "Hierarchy theory neither implies inflexibility nor a lack of diversity and creativity. On the contrary, an appropriate hierarchical, dynamic structure provides opportunities for diversity, flexibility, and creativity, as well as higher efficiency and stability that are difficult to obtain in non hierarchical complex systems." Naeem shares this account of the biosphere as a "vision of Earth as a series of nested spheres." Interestingly, such biosphere structure returns us somewhat toward the stability about which Pickett has his misgivings. But, on further thought, one can readily expect that a resilient biosphere, challenged over millennia, will have settled into some repeated stabilities—in some modular components and at some hierarchical levels (predators, prey, plants, animals, photosynthesis, trophic pyramids, DNA codings, seasonal patterns) within its ongoing dynamisms. "Hierarchic structures … provide the most viable form for any system of even moderate complexity" (Wu).

That resilience can regularly be found on the landscapes we inhabit, but it is equally needed by the human residents in search of "remediating" their world views. Thankfully, Callicott finds that some worldviews are superior to others, "a more tenable and a more viable worldview" and also more "aesthetically and spiritually satisfying as well" (as Lintott and Carlson concur). This more viable worldview is hopefully one that sees Earth as a planet with a biosphere because that is in fact what Earth is (Naeem). Life on Earth has been ongoing, dynamic, and resilient for over four billion years. We can claim such a view (in Callicott's terms) as "'knowledge' because it is a highly confirmed, self consistent worldview that is also consistent with and comprehensive of all known relevant facts."

A major trouble is humans with a sense of arrogant dominion (as Mallory realizes) as they estimate who they are and what they ought to do, inadequately appreciating that they are earthlings on Earth. Let's hope that more knowledgeable humans are resilient in reforming their worldviews and behaviors accordingly and cherishing this biosphere in which we are incarnate. "A myth is that with enough knowledge and technology we can manage planet Earth… What might be managed is us: human desires, economies, politics, and communities" (Poole, following David Orr).

Any adequate environmental philosophy, as Palmer claims, has to include issues of environmental justice and justice between generations, as well as concerns whether "non-human animals, living organisms, ecosystems and species have some kind of moral status," and there can be "deep fissures" between analysts. Hayward worries about "justice in the world today as those of a crowded planet where some people deprive others (as well as non humans) of access to sufficient ecological space." "One of the greatest ethical problems is that humans, rather than being concerned too much about humanity, are generally not concerned enough about caring for other humans." "In fact, we are now being forced to recognize that we inhabit a contained, dense biosphere that is being put under enormous strains and as we make increasing demands on its capacities, the space becomes increasingly crowded." The nature/culture—is/ought challenge is figuring out "ecological space in a crowded biosphere" (Hayward). By Northcott's account, "The inability of industrial civilisation to adapt to the climatological limits of the biosphere arises from the refusal of liberal economists and others to recognise that justice is contextual to the boundaried nature of political communities, and to the limits of the earth system."

Power is another returning theme here, always closely related to justice and injustice. So Mallory undertakes how "the critique of unequal power relations, both intra human and that between humans and what ecophilosophers term 'the more than human world' can help scientists and policy makers to comprehensively address current environmental issues, such as global climate change, environmental racism, biodiversity loss, inegalitarian social arrangements, and recognition of ecosystem services in remote, rural, and urban areas." She is convinced that "ecological issues not only have particular cultural manifestations, but are raced and gendered as well—and that equity and sustainability go together."

Questions of values and their separation and integration in sciences, such as ecology, and in the humanities, such as ethics and policy have complex dimensions. Longino examines positivism, revising that worldview into her "critical contextual empiricism," and finds a "socially contextualized conception of knowledge and of scientific inquiry," which also has a "conformation of representation to object represented." "Both philosophers and scientists must admit the role values play in the sciences while preventing the empirical from being overrun by the normative and the ideological." The need to "recognize that advocacy and public engagement [are] a necessary path for ecology" was well seen in Rachel Carson, as Cafaro details here.

Taking Pickett and Callicott's concerns about whether and how the ecological sciences can feed into a worldview in a new direction, Eliot is encouraging: "Environmental ethics does not require objects more robust than those ecology already offers." The descriptions of ecological process and products are "sufficiently real in the right sort of way." That underscores the need for "ethics literacy in environmental education," advocated by Poole and her collaborators.

Hayward invites us to "an 'ecological' way of seeing the place of humans in the world, as they relate both to the rest of nature and to each other. This leads to a conceptualisation of 'ecological space' as what answers to the most fundamental needs of human beings, such as to be appropriately regarded as the object of a human right." "By attending to lessons of ecology, we can develop much more appropriate ethical thinking than we otherwise might—not only regarding our treatment of the natural environment, but also regarding some fundamental questions of justice, and on a global scale" (Hayward). That is carefully analyzed by Northcott looking at the multiple dimensions and effects of climate change. "Anthropogenic climate change however represents a new kind of exile, this time not from ancestral lands but from earth itself."

But there are limits to the kinds of value questions that ecology can answer. "Ecology can provide insight into how we might rescue a species from extinction if we decide to do so, how to preserve a forest patch if we remove its human occupants, or how to manage a forest patch if people remain, but the questions of ethics, morality and fairness are for society to answer" (Naeem). Larson carefully examines "metaphorical links between ecology, ethics, and society," the subtle "feedback" between nature and culture again, scientific metaphors in social context. "Metaphoric choices in ecology should be subject to ethical scrutiny" (analyzed also by Pickett). Keep a critical openness—as Bratton can do with her own Christian tradition and equally of the ecologists, of which she is one, and as Sideris can do pressing those

who advocate "a mythopoeic rendering of scientific information as a robust and superior rival to religion" "recasting scientific information as a consecrated narrative and poetic vision." All this brings us to big questions about this big outdoors we inhabit, the sky over our head and the ground under our feet, the community of life, the biosphere.

We have entered the first century in 45 million centuries of life on Earth in which one species can jeopardize the planet's future with their "novel biosphere" (Naeem). The main concerns on the world agenda for the new millennium are: war and peace, escalating populations, escalating consumption, degrading environments. They are all inter-related. Ecology is about living at home (Greek: *oikos*, "house"). We don't want to live a de-natured life. Humans neither can nor ought to de-nature their planet. Be a good citizen, and more. Be a resident on your landscape. Read on, think together with these deeply concerned environmentalists, and you will get put in your place. I guarantee it.

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Preface

Confronted with global environmental change, the academic community still labors under a tradition of strong disciplinary dissociation that hinders the integration of ecological understanding and ethical values to comprehensively address the complexities of current socio-ecological problems. The Rio+20 Earth Summit held in Brazil in 2012 showed that since the Rio 1992 Earth Summit the rate of environmental degradation had increased rather than decreased (Viola et al. 2012). To reorient this trend, it is essential to overcome the narrow economic and technical-scientific approach that dominates much of the discussion in academic research, education, and decision making.

The need to strengthen the linkage between understanding human values and ecological science has been pointed out by the Ecological Society of America (ESA) and a growing number of scientists for at least half a century. In the 1980s, ecologist and former ESA president, Frank Golley concluded that the ecosystem concept has provided a basis for "a dialogue about how humans value nature," and for "moving beyond strictly scientific questions to deeper questions of how humans should live with each other and the environment" (Golley 1993, p. 205). In the 1990s, another former ESA president, marine biologist Jane Lubchenco (1998) emphasized in a position paper for *Science* that many of the choices faced by society are ethical ones, for which ecological sciences provide essential understanding to inform responsible societal decisions. During the 1990s and 2000s, a transdisciplinary integration of ecology with social disciplines, especially economics, has been institutionalized via interdisciplinary societies, research programs, and mainstream journals. Work at this interface has produced novel techniques and protocols for assessing monetary values of biodiversity and ecosystem services, as illustrated by the Millennium Ecosystem Assessment (MA 2005). At the beginning of the 2010s, however, an equivalent integration between ecology and philosophy still remains elusive (Pickett et al. 2007; Rozzi et al. 2012). This book undertakes the task to develop crucial theoretical and practical linkages between ecology and ethics through interdisciplinary, international, collaborative teamwork among ecologists and philosophers. It aims to establish a new forum and research platform to work on

this vital, but until now insufficiently researched intersection between the descriptive and normative domains. In particular, it seeks to go well beyond the predominance of economic thinking that has characterized environmental decision frameworks at the turn of the twenty-first century.

Linking Ecology and Ethics for a Changing World: Values, Philosophy, and Action resulted from the homonymous 14th Cary Conference, which brought together leading scholars and practitioners in ecology and environmental philosophy. We discussed core philosophical and ecological terminologies, methods, and questions, as well as practical frameworks to incorporate interdisciplinary integrations of ecology and ethics into sustainability policies, environmental decision making, and long-term socio-ecological programs such as the International Long-Term Ecological Research network or the UNESCO network of biosphere reserves. On the one hand, this Cary Conference is the result of a long-term theoretical endeavor to better understand the reciprocal links between ecological sciences and ethics, broadly understood as the ways we *perceive* the world and the ways we should *co-inhabit* the world (*sensu* Rozzi 1999). On the other hand, the conference and the preparation of this book are stimulated by the pressing need to address urgent practical questions on how to reorient some prevailing eco-social trajectories toward more sustainable paths; such reorientation of trajectories requires not only the natural and social sciences, but also ecologically informed ethics. To address these major theoretical and practical challenges, the present volume is organized in four interrelated parts; each one begins with a concise introduction that identifies concepts discussed in the chapters that are essential for cross-disciplinary understanding.

Part I. Integrating Philosophy and Ecology: Biocultural Interfaces

Over 2,000 years ago, ethics was established by Aristotle as an "exclusive club" in which only humans, and in fact only certain humans, had the privilege to participate. Until 20 years ago ecological sciences, especially in North America, remained focused on study sites located in wilderness areas, as remote from humans as possible. With the arrival of globalization, this divorce is no longer possible. Ricardo Rozzi proposes a biocultural ethics that dissolves the walls of the exclusive club of ethics. He invites philosophers to understand humans and other beings as co-inhabitants embedded at the interfaces of multiple biophysical, symbolic-linguistic, institutional, and socio-political levels of organization; and invites ecologists to explore interrelationships between research questions on ecosystems and biodiversity with questions on how to co-inhabit ecosystems and the planet. These questions are stated in different terms by the diverse contributors to this volume, but, foremost, this book is an invitation to explore and open new questions at the interfaces of ecology and philosophy. As Irene Klaver asserts in her chapter "Life is *vita* in Latin… An in-*vita*-tion leads to new connections, new situations, or a renewal of existing relations, which entail change and transformation. This affects how we understand things."

Peter Vitousek and Kamanamaikalani Beamer affirm that "all knowledge is embedded in values and practices, in the science of ecology as well as in any indigenous culture." They present an intercultural, interdisciplinary dialogue that transits toward the practices involved in the development of the Kamehameha Schools in Hawaii. Grounded in a Hawaiian integration of ecological knowledge, values, practices, and institutions, they ask: "How can [traditional] institutions and societies sustain themselves while in contact with the homogenizing power of the modern world? And, what can such institutions or societies bring to living more sustainably in the world, through their values, practices, and knowledge?" In local–global dialectics, stewardship and dialogic partnerships bring twenty-first century ecologists, philosophers, and other professionals to work together with traditional communities both in remote places and in metropolises. Historically, universities have conducted *outreach* programs that offer one or a set of potential problem-specific solutions, such as gardening or renewable energy. However, partnerships aim to also foster *inreach* from communities to the university, as emphasized by Stuart ("Terry") Chapin and his Alaskan collaborators. The local–global dialectic is not always idyllic, however.

Daniel Simberloff discusses the motives people have for antipathy towards introduced biological species, including ecological and economic negative impacts, aesthetics and at various times xenophobia. However, antipathy towards introduced species is frequently inspired not by their foreign origins *per se* but rather by the fact that their presence replaces local biodiversity, and also culture. Tensions between native and foreign biota and cultures are frequently tacit. For example, when, shortly after the arrival of the Spaniard conquerors, the Virgin of Guadalupe appeared to Juan Diego Cuauhtlatoatzin in Nahuatl territory, she offered him a *tilma* full of fresh roses, not of native flowers. As Susan Bratton describes, the Virgin of Guadalupe has a long-established role as protector of the humble and undefended, and today her image is found at roadside shrines, bus pennants, and school decoration where (non-native) roses are omnipresent. How to address the tensions between native floras and cosmopolitan ornamental species such as roses that comprise 66 % of the world flower market today? Irene Klaver suggests that philosophers can act as translators: "An environmental philosopher is an initiator, translating various concerns along multiple perspectives opens up new situations and affords us the freedom of ongoing new beginnings. It is crucial to an understanding of [and respect for] the various viewpoints, positions, places and experiences of others."

Part II. Ecological Worldviews: Aesthetics, Metaphors, and Conservation

Twenty years ago, in another book in the Cary Conference series, Mark McDonnell and Steward Pickett (1993) apologized to Sergio Leone and the genre of "Spaghetti Western" for describing the ecological influences of humans as divided between the "the good, the bad, and the subtle." McDonnell and Pickett there focused on human influences on the biophysical properties of ecosystems, and a major spectrum of

ecological novelties that came with "the subtle." In this volume, J. Baird Callicott addresses a symbolic-linguistic level of reality, by focusing on the concept of worldview. With a post-Kantian epistemological freedom and a Leopoldian ecological wisdom, Callicott identifies: a "bad" worldview associated with an "Abrahamic" concept of the land, regarded as a commodity that belongs to humans; a "good" worldview associated with an ecological-evolutionary concept of the land, regarded as a community to which humans belong. The *philosophical novelties* come with his call for a worldview remediation. How to decide which are bad and good, wrong and right worldviews? In a post-Kantian world "to determine the *truth* of a worldview by comparing it… to some objective reality is epistemologically impossible. We have no unfiltered access to any such objective reality." To address this aporia, Callicott turns to the concept of the "tenability" of a worldview. To the traditional epistemological criteria of self-consistency and of consistency with the empirical evidence, he adds "to be more tenable and a more viable worldview than are its historical antecedents, I think that Leopold would also add a third criterion for the tenability of a worldview: it should be aesthetically and spiritually satisfying as well." The integration of aesthetic and spiritual dimensions of ecological worldviews is discussed in the chapters of Part II of this volume.

Aldo Leopold's highest moral maxim summarizes that "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." Sheila Lintott and Allen Carlson ask: "How does the word 'beauty' fit in this maxim?" To answer, they introduce a compelling cognitive approach to aesthetic appreciation, which enables them to explain why "beauty" is introduced into the Leopoldian maxim, and which are the ethical consequences of having this word introduced within this maxim. According to the cognitive approach, ecological understanding stimulates a broader aesthetic appreciation that goes beyond a mere *picturesque* stereotype of landscapes. Once aesthetic refined appreciation is achieved, it motivates the preservation of lands that have ecological aesthetic value. In a three-step movement, from (i) ecological understanding to (ii) aesthetic appreciation onto (iii) the preservation imperative, the traditional fact/value problem is avoided. When ecological facts are embedded within aesthetic appreciation, there is no direct movement from facts to values. The movement is wholly from aesthetic value, which is itself informed by ecological facts. Within a broader historical and cultural context, it is interesting to note that aesthetic has been indeed a major motivation for conservation in the United States (Hargrove 1989), and other regions such as Germany (Jax and Rozzi 2004). Moreover, the word "ecology" was coined by a German artist and scientist: Ernst Haeckel.

At a socio-political and institutional level, Aldo Leopold's endeavor is analyzed by Curt Meine, who emphasizes that "creative interdisciplinary thinkers in the history of both ecology and ethics have ventured beyond their disciplinary boundaries and into the zone where they overlap." Meine emphasizes how Leopold was vigorously committed to encourage his colleagues and students to be integral professionals, much more than mere trained technicians. With the guidance of a fluent historian, such as Meine, we appreciate how Leopold offers us an outstanding example of how to integrate conservation science, policy, philosophy, and practice. Rachel Carson's life offers a complementary perspective on the integration of theory and practice

embedded in an ecological worldview; her science led her to an outstanding life of advocacy. After a 15-year career as a U.S. Fish and Wildlife Service biologist, she learned about the beauty of wild places and biodiversity, and the wounds caused by humans to habitats, their plants and animals. Phil Cafaro shows how Carson's life teaches us much about humility and courage, a courage that allowed her not to remain silent, and to denounce the "Silent Spring" that had been caused by the indiscriminate use of pesticides. Cafaro quotes a letter in which she wrote "if I kept silent, I could never again listen to a veery's song without overwhelming self-reproach." Lisa Sideris emphasizes in her chapter the significance of everyday experiences, such as listening to the songs of veeries. She concludes that encounters with the natural world are essential and that a variety of worldviews can orient these everyday experiences that nourish our reenchantment with nature and give us the courage to protect it. Brendon Larson, however, cautions that different worldviews and metaphors arise from and stimulate different social practices and values. He calls attention to the synergistic, multidirectional, feedbacks between metaphors and the ecological (and other sciences) and the social contexts in which these metaphors originate, enriching the understanding about the reciprocal links between ecological sciences and ethics, and about potential and actual pathways to enact worldview remediations.

Part III. Environmental Philosophy: Ethics, Epistemology, Justice

Fifteen years ago, as an epilogue to the Cary Conference book on the Ecological Basis of Conservation, Joel Cohen wrote "A Vision of the Future," which began proclaiming that:

> If conservationists, together, with demographers, economists, earth scientists, anthropologists and politicians, could put forward a positive and persuasive vision of the future, they could lead billions of nonscientists to look to conservationists as helpful allies in their search for better lives. They could also give direction and meaning to the daily research that occupies many scientists (Cohen 1997, p. 400).

In our own Cary Conference we addressed Cohen's recommendation. In order to work on this question, we began by extending the scope of the participants. First, we considered not only scientists but also philosophers, traditional ecology and religion studies scholars in the team of participants who are experienced in examining the concepts of "better lives." Second, we considered not only human beings but also other-than-human beings in the discussions about a "better life."

Part III of our volume begins with Clare Palmer's chapter that introduces some essential terminology from what she calls "Anglo-American" approaches to environmental ethics. This terminology is helpful in addressing core ethical questions such as: (i) *Where does value come from?* Subjectivists maintain that value are created by human beings; objectivists maintain that, in some sense, values exist in the world independently of our creating them. (ii) *What entities and attributes have value?* For some environmental ethicists, not only individual living beings have value, but also species and ecosystems; while we may also values qualities such as

naturalness and diversity. While traditionally philosophers have privileged human rationality, ethicists have increasingly expanded the circle of those they consider to have some kind of moral relevance. A focus on sentience (roughly, the capacity to feel pain and pleasure) enables the inclusion of other vertebrates in the community of morally relevant beings. Some philosophers – biocentrists – argue that all living-beings have a welfare and are therefore morally relevant. Ecocentrists argue that inclusive entities such as ecosystems and species are morally relevant in themselves; thereby they do not only extend the moral community, but they also propose new "new objects of value" – a question explored further in Eliots's paper in this Part III.

Palmer further addresses the questions (iii) *Which ethical theories should orient human actions?* (iv) *Should people decide on a single governing value, principle or ethical theory?* Different forms of ethical monism and pluralism are discussed with regard to values, ethical theories, and methodological approaches, and applied to the context of policy and decision making. Palmer's overview equips the reader with an ethical vocabulary, and an introduction to central values and theories, as well as conflicts among the different positions. She does not advocate for a particular position, but leaves ecologists and other readers better equipped to address Joel Cohen's question about the concept of "better lives."

Consistent with a conceptual framework that interrelates the ways we understand the world guided by sciences, and the ways we should co-inhabit the world guided by ethics, Palmer's chapter is followed by a chapter on scientific epistemology. Helen Longino focuses on *positivism*. This focus is very relevant given the high influence that positivism has had and continues to have on scientists, ecologists included. Longino provides a concise but critical historical overview of positivism. She considers criticisms of *verificationism* flowing from the notions of *incommensurability*, *theory-ladenness of meaning*, and *underdetermination*. Addressing these criticisms, Longino has developed an interesting alternative: *critical contextual empiricism*. Longino distances herself from the original meaning of positivism, and arrives to (at least) three conclusions that are particularly relevant for a biocultural approach to ecology and philosophy: (i) "It is possible that multiple non-reconcilable accounts of the same set of phenomena be equally acceptable"; (ii) "Local epistemologies are evaluable with respect to the particular cognitive goals brought to bear on a phenomenon or set of phenomena"; and (iii) "knowledge in this framework must also be understood as partial and as dynamic. Partial because limited by the questions, and their associated assumptions and methodologies."

Part IV. Ecosystems: Science, Values, and Action

In the opening plenary lecture of the first Cary Conference in 1985, Gene Likens asked:

> Why is ecology so fractioned at the current time? Is this healthy or normal? … Should we get our act together to make some quantitative jump in understanding of ecosystems? … Our hope is that the Conference will be useful, not only in examining these questions, but in providing some insight about where ecology may go in the future and how it might make a quantum jump in terms of our understanding of ecosystems (Likens 1987, pp. 1–2).

Our answer to Likens' initial questions is that, today, the branches of ecology are much more intertwined. Each Cary Conference has made significant contributions in a series of quantum jumps in the development of the field. Our 14th Cary Conference made an ethical quantum jump: we move from questions about "understanding of ecosystems" to an integration of them into questions about how to "co-inhabit ecosystems."

To address these new transdisciplinary questions, ecology provides "theoretical lenses" or paradigms that orient the understanding of our place in ecosystems and the biosphere, as well as "practical lenses" or cross-disciplinary methodologies for integrating ecology and environmental philosophy into research, education, and ecosystem management practices, thereby broadening current theoretical and applied approaches to enhance regional and global sustainability. Part IV begins with two chapters by ecologists who have contributed to a shift in the twenty-first century ecological worldview: Steward Pickett provides an updated view of "the flux of nature" paradigm, and Jingle Wu offers an encompassing overview of hierarchy theory.

Two scientists present chapters that outline important frameworks that inform contemporary ecology, and hence are relevant to how the sciences might interact with the theory and practice of ethics. Steward Pickett notes the shift in paradigm from the classical worldview, based on *balance of nature* and its technical expressions. Important assumptions have been altered, by the new *flux of nature* paradigm. These acknowledge the openness of ecosystems to material fluxes, the regulatory role of external influences, the lack of a single stable end point to dynamics, and the role of disturbance and probabilistic dynamics, and finally the entanglement of humans with the biota and physical structures of ecosystems. In addition, the complexity of the science of ecology is illustrated by methodological paradigms that focus on individual entities as opposed to material and energetic fluxes, and which focus on instantaneous, contemporary dynamics as opposed to historical legacies in environment and adaptation. The science of ecology is making great strides in overcoming the fractured nature of its knowledge base and explanatory apparatus noted by Likens in the quote above (Pickett et al. 2007).

Further structuring ecological science is hierarchy theory, introduced by Jianguo Wu. Ecological systems are seen as self-organizing, nested hierarchical systems, in which scaling relationships and partial decoupling are important. These last two features suggest that the generalization that "everything is connected to everything else" is misleading in the realm of ecology, and hence its application. Complex, hierarchical systems are in fact highly modular, such that the successful ones can isolate the effects of disturbance and stress before they ramify unchecked across an entire system. Understanding system dynamics and characteristics emerges from focusing on a given level of organization, while understanding the slower moving dynamics from the level above as constraints, and the faster moving dynamics of the lower level as mechanisms. The principles laid out by Wu apply to all ecological systems, of whatever scale or specific methodological paradigms they fit, whether large or small, or whether they focus on entities versus aliquots, historical versus contemporary causation.

The chapter by Shahid Naeem further elaborates on a view based on nested hierarchical levels of organization, and points out that this view is inconsistent with current political, technological and economic governance. He highlights that in spite of the vast growth in scientific information, the prevailing Western scientific view of ourselves and life on Earth has not changed much since Ancient Greece. The overarching worldview of nested spheres remains essentially the same. The modern scientific view of life is that it exists within a slim sphere; the biosphere, which suffuses into the hydrosphere and atmosphere, is nestled between an underlying sphere of rock and magma and the vast expanse of the cosmos above. The notion of ecosystem services seems very narrow within this broader worldview. The ecosystem service construct is clearly important, but it is insufficient by itself to form the foundation for our environmental actions aimed at achieving environmental sustainability because it continues to promulgate the notion that nature is in the service of humanity. The worldview and the empirical evidence suggest that such an approach may be an impediment rather than a catalyst for achieving environmental sustainability. Naeem admonishes that the decoupling of economics and technology from the biosphere has increased exponentially, and if we do not reorient our socioeconomic trajectories toward coupled socio-ecological ones, then we will cross the sustainability thresholds of the functioning biosphere.

Based on her long-term ecological studies in Los Angeles, Stephanie Pincetl adds in her chapter another layer of difficulty to couple social and ecological spheres. For the last two decades, in the United States, public funds for cities have steadily declined, particularly for parks and recreation. She raises three questions that are relevant beyond the case of Los Angeles: "What to make of all these efforts in a time of budget shortages and rise of nonprofit philanthropy? How are the agendas set and carried out? What community participation is involved and whose vision is being advanced?" Pincetl presents emerging new urban ecosystem and greenspace public/private initiatives for greater urban sustainability led by public/nonprofit partnerships. However, these initiatives are characterized by opportunism, little accountability and consultation, and in low-income communities, they may create an additional burden of responsibility and labor for maintaining these new infrastructures. The type of governance and government organization is central, and public administration should ensure coverage of essential socio-ecological needs in urban ecosystems encompassing both rich and poor neighborhoods. For example, projects such as stormwater infiltration, whose relevance Irene Klaver analyzes from a phenomenological and community perspective in Part 1, would require indispensable public administration for long-term socio-ecological urban sustainability and justice.

Nalini Nadkarni offers an alternative to address some of the concerns expressed by Naeem and Pincetl. According to Nadkarni, "ecosystem ecology provides a powerful framework to understand and care for biota and the environment." The key is to enhance the capacity of ecologists to communicate and the valuation that academia and scientific societies give to initiatives to share ecological knowledge

with people outside of academia, particularly with underserved audiences and those who have little exposure to science and nature. Nadkarni critically assesses the effectiveness of the way in which the "Second Criterion" or Broader Impacts Statement of the National Science Foundation (NSF) is being implemented by researchers and institutions. Most of the proposals submitted to NSF included just teaching and training mostly for small groups (<50 people) that are close to academia, and less than 10 % of the proposals considered assistance with under-represented groups. To overcome this narrowness, Nadkarni illustrates several case studies of interactions among scientists and diverse social groups that show ways of linking ecological and social values, and the relevance of direct exposure to nature. Interestingly, Nadkarni not only *reaches out* to diverse and numerous audiences, but she also *reaches in* to the epistemic community of ecologists, demonstrating the decisive impact that early experiences of exposure to nature had on their career paths. The chapter by Alexandria Poole and collaborators also highlights case studies that emphasize the relevance of direct encounters in nature. Complementarily she and her colleagues address two major barriers to integrate ecology and ethics in education, from elementary school to higher education. First, the *assumption of value free science*, although outdated is still prevailing. Second a two-century-long *culture war* prevents the teaching of ethics in the United States. Latin America has also suffered a severe reduction in ethics education since the 1960s (Rozzi 2012). Despite these barriers, as demonstrated by the previous chapters of this book, conceptual frameworks are available for an academic, interdisciplinary education of ecology and ethics both in school and higher education. As a good example of an axiological model that integrates ecology and ethics, Poole at al. refer to Holmes Rolston, III, one of the founders of the field of environmental ethics. Rolston (1985) identified a variety of environmental values in wilderness areas, and he identified the ecosystem as the fundamental one. According to Rolston, organism values, individual and social preferences, and market prices and economic values should be always subordinated to ecosystem values. Poole et al. highlight Rolston's axiology by affirming that:

> Inverting the value hierarchy—i.e., treating economic value as the primary value as we usually do—is as incorrect as planting a tree with its roots in the air.

The chapter and the book conclude with the presentation of six ongoing education programs that integrate ecology and philosophy. These ongoing programs take place in different regions of the Americas, from the United Sates to Mexico, Colombia, Venezuela, Guyana, along the Andean and Amazonian Ecuador, Peru, Bolivia, to Argentina, Chile and the southern end of the Americas in Cape Horn. These programs involve scientists, philosophers, and educators working in formal and non-formal education, developing conceptual basis and practical strategies for the integration of ecological and ethical concepts, theories, and values, into methodologies that involve inter-institutional and international collaborations.

Future Projections at the Interfaces of Ecology and Philosophy

This book builds on the valuable history of a series of Cary Conferences and ecosystem science books that progressively have included (i) humans as components of ecosystems, (ii) interdisciplinary approaches to investigate ecosocial questions, and (iii) the integration of theory and practice to achieve broader ecological understanding and decision making (Table I). Embedded in this trend, the 14th Cary Conference innovated by having been jointly organized by three different institutions that

Table I Series of Cary Conference books

Conference title	Year	Publisher	Editors
1 *Status and Trends in Ecosystem Science*	1985	IES	Likens et al. (1987)
2 *Long Term Studies in Ecology*	1987	Springer	Likens (1989)
3 *Comparative Analysis of Ecosystems*	1989	Springer	Cole et al. (1991)
4 *Humans as Components of Ecosystems*	1991	Springer	McDonnell and Pickett (1993)
5 *Linking Species and Ecosystems*	1993	Chapman & Hall	Jones and Lawton (1995)
6 *The Ecological Basis of Conservation: Heterogeneity, Ecosystems, and Biodiversity*	1995	Chapman & Hall	Pickett et al. (1997)
7 *Success, Limitations and Frontiers in Ecosystem Science*	1997	Springer	Pace and Groffman (1998)
8 *Understanding Urban Ecosystems: A New Frontier for Science and Education*	1999	Springer	Berkowitz et al. (2003)
9 *Understanding Ecosystems: The Role of Quantitative Models in Observation, Synthesis, and Prediction*	2001	Princeton University Press	Canham et al. (2003)
10 *Ecosystem Function in Heterogeneous Landscapes*	2003	Springer	Lovett et al. (2005)
11 *Disease Ecology: Effects of Disease on Ecosystems and of Ecosystems on Disease*	2005	Princeton University Press	Ostfeld et al. (2008)
12 *Resilience in Urban Ecology and Design: Linking Theory and Practice for Sustainable Cities*	2007	Springer	Pickett et al. (2013)
13 *Effective Communication of Science in Environmental Controversies*	2009	Frontiers in Ecology and the Environment (Special Issue)	Groffman et al. (2010)
14 *Linking Ecology and Ethics for a Changing World: Values, Philosophy, and Action*	2011	Springer	Rozzi et al. (2014)

became independently interested in the interface of ecology and philosophy: the Cary Institute of Ecosystem Studies, New York, the Institute of Ecology and Biodiversity (IEB-Chile), and the University of North Texas (UNT). The Cary Institute provided the strength of a tradition of cutting-edge research on ecosystem science and coupled human-nature systems. IEB added for the first time in the history of the Cary Conferences an international partner, which represents a leading Latin American research center committed to develop long-term socio-ecological research in southwestern South America. The UNT Department of Philosophy and Religion Studies and its Center for Environmental Philosophy integrate epistemological, ethical, and environmental justice approaches to address socio-ecological challenges. In this way, the 14th Cary Conference builds on a strong partnership among these three institutions, which have different histories of long-term collaborations between ecologists and philosophers, as shown by previous international workshops, such as *Comparative Studies of South and North American Temperate Ecosystems* held in January 1991 (Pickett and Armesto 1991), *Integration of Ecology and Environmental Philosophy into Biocultural Conservation and Long-Term Socio-Ecological Research* held in March 2007 and June 2008 (Rozzi et al. 2008; Anderson et al. 2010), and *Latin- (inter-) American Conference on Environmental Philosophy* held in March 2013 (Massardo et al. 2012) with participation of ecologists and philosophers from the USA, Chile, Latin America and other regions. These workshops were aimed at building the theoretical and practical foundations for integrating ecological sciences and environmental ethics into long-term socio-ecological research programs, including the new Long-Term Socio-Ecological Research (LTSER-Chile) network in southwestern South America (Rozzi et al. 2012).

Through this Conference and book, this partnership aims to stimulate further growth of the field and to consolidate action plans for improved cross-disciplinary integration, generating innovative research questions and approaches, broader professional training, practice, and place-based projects. The results will be essayed in Long-Term Ecological Research (LTER) programs at national and international sites that span from urban to remote pristine ecosystems, the exploratory network of Urban Long-Term Ecological Research Areas (ULTRA), or in forest, range, and aquatic management programs, as well as UNESCO biosphere reserves that integrate the goals of improving human well-being and the preservation of biological and cultural diversity. As an example of setting in motion the interface of ethics and ecology at the southern end of the Americas (Rozzi et al. 2012), we are currently making progress in the following endeavors: (1) creating new field work methods that bring together ecologists and philosophers, thus fostering novel research questions and broader understanding of human-nature relationships; (2) developing a cross-disciplinary agenda of workshops and courses, based on a network of field stations associated with LTSER-Chile, which creates opportunities for training, academic discussion and collaboration among practitioners of ecology, philosophy, and other professions; (3) guiding field-based, co-tutored, graduate theses that integrate ecological and ethical concepts to address critical issues in the disciplines; (4) strengthening research on environmental ethics and ecology in a region of the world threatened by large-scale economic development projects (such as, salmon

farming, hydropower) that are often in conflict with local community aspirations; (5) conducting transdisciplinary research programs with government agencies and local communities. Such activities are being supported through collaboration agreements among local universities (e.g., Universidad de Magallanes), national research Institutes (Institute of Ecology and Biodiversity, Chile), and international research programs based at academic institutions (Sub-Antarctic Biocultural Conservation Program, at the University of North Texas, USA). This model of interaction among disciplines, academic institutions, regional authorities and local communities can offer a valuable scenario for assessing methodological approaches essayed at the interface of ethics and ecology.

The fundamental importance of broadening socio-ecological research and better integrating human values in environmental decision making in this rapidly changing age compels us to continue the task addressed in this Cary Conference by organizing a series of activities on *Linking Ecology and Ethics for a Changing World: Values, Philosophy, and Action* at the 100th anniversary of the Ecological Society of America that will take place in Baltimore in August 2015. Our present volume aims also to become the first of a new series of books on Ecology and Philosophy published by Springer. This series will be devoted to continuing research at the interfaces of ecology and ethics (embedded in the multiple fields of philosophy) to broaden our conceptual and practical frameworks in this transdisciplinary field. We hope that this will help to effectively guide society toward more sustainable and just ways of co-inhabitation among diverse humans, and among them and other-than-human co-inhabitants with whom we share our habitats in the heterogeneous regions of the planet.

Denton, TX, USA — Ricardo Rozzi
Millbrook, NY, USA — S.T.A. Pickett
College Station, TX, USA — Clare Palmer
Santiago, Chile — Juan J. Armesto
Denton, TX, USA — J. Baird Callicott

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