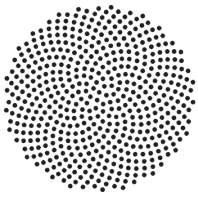


Fracking, Oikos and Omics in the Karoo: Reimagining South Africa's reparative energy politics

Lesley Green

As a South African, I speak from a heartland of struggles over land and soil and ocean; of contests over economy, food production, and mineral rights. I speak from a landscape in which my **great great** grandfather, in the 1820s, left the coattails of English society to take ownership of land that became a farm that bore the name of a military post of the British Empire in their Frontier War against the AmaXhosa, in the Eastern Cape of South Africa. His son, who was my **great** grandfather, ran one of the first printing presses in the Eastern Cape, printing the stories of the battles on the farms between the English colonists and the AmaXhosa. His son, my **grandfather**, was born during the Anglo Boer War and enlisted in the First World War as a teenager; my father grew up in the shadow of the Second World War, and I grew up in the shadow of the South African Border War in which the apartheid military fought Africans and Cubans engaged in liberation struggles across in South Africa, Namibia, Angola, and Mozambique. Five generations; five wars; some local; all global; all bound up in the rise of modernity and coloniality.

In opening a dialogue about South Africa's debates over land, economy and ecology in the anthropocene, I speak, then, as one of the privileged, who had the benefit of a lineage of patriarchs who won wars, who had access to land under the sign of Empire, and who had privileged positions in the economy under the sign of Apartheid. My father had a "whites only" job; and as a child, I attended a "whites only" school where a teacher who read King Lear, taught me that the wheel of fortune was not the "natural" order of things, but an effect of ideas, power, and actions. From the story of King Lear I found the



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courage to persuade my father to send me to the University of Cape Town, where I began to find my voice in student protests, and find my feet, in running from teargas.

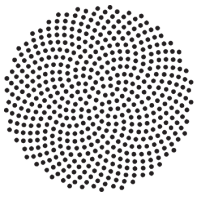
Turn, the wheels of power did in South Africa, led by Trade Unionists, by women activists, by prisoners and detainees in jails and in exile. The cry of the time was "*Amandla Ngawethu!*" – "power to the people!" – was the cry that made another world possible in South Africa, when Nelson Mandela was inaugurated as President in 1994.

By 2004, ten years into democracy, the wheel in the Trade Union logo **had** turned for **many** activists. Many former trade union leaders had been absorbed into a new class of elites. The supply of water and electricity to townships was one of the great achievements of Nelson Mandela's government, and in the course of that decade, the liberation cry "Power to the people!" gave force to the national project of supplying "Electricity to the people!" .

In 2014, twenty years on, the struggle has continued for the impoverished and marginalised while the wheel of fortune has continued to turn for others. Between 1993 and 2009, South Africa's Gini co-efficient – the indicator of inequality –increased, rather than decreased,¹ making South Africa, along with Brazil, one of the most unequal societies in the world. At the same time, the single national electricity supplier is in financial trouble, and unable to supply all the energy needs for the developing economy. Into the deepening crisis around the shortage of the electricity that would support the economic development that would bring the jobs that would improve the Gini coefficient, stepped the oil industry in the form of a study commissioned by Shell South Africa, which described shale gas in the semi-arid Karoo region as a "game changer" for the country. The report estimated the amount of gas to be in the trillions of cubic feet. The wheel no longer needed revolution; there was a new game in town.

Thus it was that South African President Jacob Zuma's State of the Nation Address in May this year announced that shale gas extraction, or fracking, would go ahead.

¹ From 0.59 in 1993 to 0.63 by 2009, in the World Bank's estimation: http://en.wikipedia.org/wiki/List_of_countries_by_income_equality. By another account, it increased from 0.66 in 1993 to 0.7 in 2008 -- Daily Maverick. 2012. http://www.dailymaverick.co.za/article/2012-08-15-brazil-and-south-africa-united-in-inequality/#.VA1JCq_lrIU

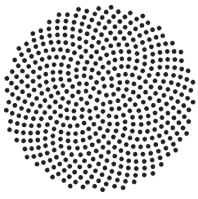


Fracking is a new technology. It involves drilling vertically several kilometers under the surface of the earth, and then turning the drill head sideways to drill horizontally along a stratum of shale. Once drilled, some twenty million litres of water per frack, per well, are pumped in at high pressure, along with two hundred thousand litres of chemicals, in order to fracture the seam and collect the gas in the liquid. Once extracted, these several millions of litres of fracking fluid per well will need to be kept permanently out of the hydrological cycle. Since each well can be fracked several times, and hundreds of wells will be created per shale formation, the loss of water to the region stands to be in the trillions of litres.

The argument that shale gas fracking will be a "game changer" for the South African economy is that it will provide energy autonomy, that it will create jobs,² thus creating the conditions of power in which, finally, an historic economic adjustment can take place: one that will "unlock the wealth of the land". Such a game-changer would address the historic injustices of global wealth and power, and the legacy of wars that have accompanied the making of the modernity that has scorched ecologies, and in the process, displaced so many from its new economies. The paradox, however: is that the game changer will also scorch ecologies, and it is the same game that has brought the planet to the beginnings of catastrophe. It is the logic of the anthropocene, in which the growth of capital is at the expense of soil, and of water.

Speaking against the "game changer" argument, is a challenge for those of us who grapple with what it means to be human in this anthropocene in a place like South Africa which grapples with historical legacies of inequality. Familiar in the opposition of "environment" and "development" is the binary of modernist thought: nature vs society. Notwithstanding the work of many South African scientists and engineers to link environmentalism with justice and sustainability, the binary has been an obstinate one. "Environmentalism" in South Africa, readily slips into the genre of the White Man's

² In the same moment, another game changer has emerged, in the form of a new opposition political party in Parliament which, wearing red worker overalls in Parliament, seeks to change the game of the plundering of the public purse, chanting at the President "Pay Back The Money!"



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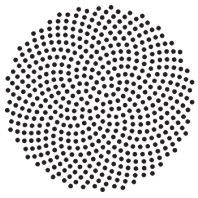
Burden, in opposition to the apparently "real" world framed by the urgency of the agenda of reparative economics that takes form in response to immense suffering. Where "Green" is the new "Red" in many parts of the world, "Green" risks slipping inexorably, in South Africa, into the new "White" (and the argument is not simply pejorative – in a context in which environmentalism has historically proceeded by fortress conservation). The case risks being closed; the game altered by the promises of new fuel technologies as South Africa powers its way into the brave new world where South can finally compete with North on its own terms.

The argument of the "game changers" in government is that in order to address the cries of the southern African precariate to enter into the global economy, sacrifices of ecology are needed. The South African land can pay the price of redemption from the entrenched global economic order based on fossil fuels. Looking at this anthropologically, ontologically, there is something very interesting going on here: where the conceptual force of racism involves transforming human subjects into objects whose labour could be extracted by force to power the colonial and apartheid economies, the fracking lobby transforms the land into an object whose gas can be extracted by force to power the nation's liberation from the shackles of a racist economy, via the particular distribution of profits proposed by government. The substitutionary atonement that the land must offer, in the fracking game, is indeed messianic: for former South African Energy Minister, Dipuo Peters, the gas in the shale formations beneath the Karoo region is "the blessing of God".³ The implication, for patriots: one dare not act against God – notwithstanding the banning by the City of Angels, Los Angeles, of that blessing, along with Nova Scotia; France; Germany, and other towns, cities, and states worldwide.⁴

The irony of the substitutionary atonement argument, in South Africa, is the usefulness of its argument for the fossil fuel industry. Where the colonial order was characterised by spectacular displays of wanton destruction of human life – a

³ "Minister touts shale gas fracking", News24, May 17 2012. <http://www.news24.com/SciTech/News/Shale-gas-a-gift-from-God-minister-20120517>

⁴ For a list of fracking bans worldwide, see <http://keptapwatersafe.org/global-bans-on-fracking/>. The list is however not fully up to date. Accessed 7 September 2014.



"necropolitics" in the words of Achille Mbembe,⁵ the neo-colonial order of multi-national companies is characterised by spectacular displays of mass destruction of remote places. "We can't let little countries screw around with big companies like this,"⁶ declared one Chevron lobbyist in the course of its 18-year, \$9bn, court battle against Ecuador which had demanded it clean up its spills in the Amazon. "Africa is under-polluted," wrote a senior figure in the World Bank; his argument was for the creation of a new export industry to Africa: the creation of global e-waste zones, such as that in Ghana. Such a "necropolitical ecology"⁷ is not limited to the former colonies in Africa and Latin America. Neoliberal economics constitutes a new colonialism, -- one that works by the reduction of everything to one value: market value writes Beth Povinelli⁸. Echoing her argument, Michael Finewood and Laura Stroup note in their critique of fracking logics in the USA:

As market approaches to environmental regulation become a more accepted, and perhaps a dominant part of governance strategy ..., places like northeastern PA are, "written off for environmental destruction in the name of a higher purpose, such as the national interest" (Scott 2010, 31). These "sacrifice zones" assume an ecological disconnect between people and their environment, normalizing environmental degradation in some places while protecting others, and also assume no alternative uses of land or energy resources. This can be viewed as a form of remote environmental exploitation and brutality where the scalar issues make these sacrifice zones almost invisible to the larger nation and world.⁹

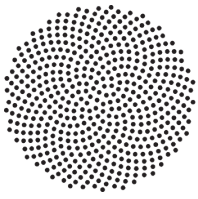
⁵ Achille Mbembe 2003. Necropolitics. *Public Culture* 15(1):11-40

⁶ <http://www.newyorker.com/magazine/2012/01/09/reversal-of-fortune-2>, accessed 28 Aug 2014.

⁷ Connor Joseph Cavanagh and David Himmelfarb, 2014. "Much in Blood and Money": Necropolitical Ecology on the Margins of the Uganda Protectorate. *Antipode* Vol. 00 No. 0 2014 ISSN 0066-4812, pp 1-19 doi: 10.1111/anti.12093

⁸ Elizabeth Povinelli, 2011. *Economies of abandonment: Social belonging and endurance in late liberalism*. Durham NC: Duke University Press, p. 134.

⁹ Michael H. Finewood and Laura J. Stroup, 2012. Fracking and the Neoliberalization of the Hydro-Social Cycle in Pennsylvania's Marcellus Shale. *Journal of Contemporary Water Research & Education*, Issue 147, Pages 72-79, March 2012.



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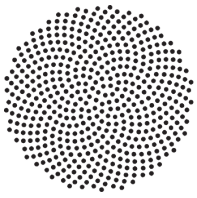
Struggles over shale gas are indeed contests over the divinities of reason in the cosmos: they are struggles over development, citizenship, nature, empowerment; struggles over governance itself; struggles over the production of evidentiaries; struggles over histories and futures and what it means to be a person in the Anthropocene in the age of rage:¹⁰ the rage of those excluded from the peace of consumerism at the end of the modernist dream. The peace treaty of the moment, in South Africa, is the *pax consumerati*: in which the rage for economic-reparations is to be exploded into the earth; secret, hidden, remote seismic explosions to release historical debts – and finally establish the possibility for all to be equally human.

Race, rage, grief: becoming equally human in the anthropocene is the music of our spheres. Amid all of the history of human injustice in the past few centuries, the struggle for equality comes to fruit at precisely the same moment as the struggle to keep the earth's ecological systems alive. We who were raised on the idea of credit against future earnings, are learning that our future Visas on the planet are already overdrawn. Liberation in South Africa has been tied up with a dream of consumption: and indeed, our political leaders flaunt Mercedes Benzes; Breitlings; Dolce and Gabana, as if there were no tomorrow. And indeed, why should there be? South Africa is one of the "Non-Annex countries" in terms of the Kyoto protocol, the logic of which is broadly *If elite excesses have produced this anthropocene, why should those who were left out, limit their prospects?*¹¹

The idea pervades climate negotiations: the creation of categories of Annex countries and non-Annex countries reflects on the one hand a concern for justice, but on the other, a distrust of the agenda of climate change as a new universalism of the anthropocene risks distracting us from the task of addressing historical inequity. The UN Framework Convention on Climate Change noted that South Africa was one of "a few

¹⁰ Richard Poplak, 2014. *Daily Maverick*.

¹¹ Eberhardt et al explain: " The goal of the Kyoto Protocol is to limit emissions of greenhouse gases (GHGs). According to the treaty, in 2012, Annex I Parties who have ratified the treaty must have fulfilled their obligations regarding GHG emission limitations established for the Kyoto Protocol's first commitment period (2008–2012). These emission limitation commitments are listed in Annex B of the Protocol. Non-Annex 1 countries, like South Africa, are not obligated by these caps." See Anton Eberhard, Joel Kolker, and James Leigland, 2014. Renewable Energy IPP Procurement Program: Success Factors and Lessons. Washington DC: Public-Private Infrastructure Advisory Facility (PPIAF), World Bank.



Parties, which are highly dependent on income generated from the production, processing and export of fossil fuels ... [and are] concerned about the possible impacts on their economies of the implementation of mitigation measures by developed country Parties..."

¹²

What then is the role of the Environmental Humanities in non-Annex countries like South Africa which claim exemption from binding obligations to reduce emissions?

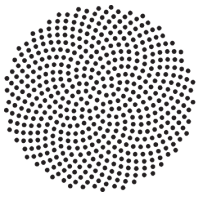
As I see it, our challenge is nothing less than the re-storying of what it means to be a person in a time of endings: becoming human in an anthropocene. The need is for a game-changer, indeed, but a reparative economics in fracking and nuclear is not a game changer at all – but necropolitics by other means.

With South Africa poised on the edge of selling its Karoo substrata to oil companies in order to change its economy, I want to make a case for a reparative oikologics in three specific vignettes, to try to disrupt the point and counterpoint in the familiar rhythms of argument for and against fracking in which ecology and economy are pitted as opposites. In the first part, I want to work with a geo-ethnography of the Karoo, looking at the primary product of fracking, which is Methane, in relation to its rock and water and ecology. In the second vignette I want to look at the Cosmology of Cement: the substance that literally has enabled moderns to make rock at will; to create an earth according to a particular cosmological geometry proposed by Descartes when he laid the foundations of modernist thought. The third vignette, proposes an alternative cosmology: an Oikologics for the Anthropocene.

I Rock, Water, Methane, Sun, Karoo¹³

¹² UNFCCC 2005. <http://unfccc.int/resource/docs/2005/sbi/eng/18.pdf>

¹³ <http://www.shutterstock.com/s/methane+molecule/search.html#page=2>



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The word "Karoo" is a San word that means "land of great thirst". A semi-arid, sparsely populated region of about 600 000 square kilometers of farms for sheep, olives and game-hunting,¹⁴ the Karoo comprises dusty roads; San rock shelters; small bushes which have taken hundreds of years to get to their bonzai size; sheep farms, olive plantations, game farms, hunting lodges and new shanty towns that have sprung up as many farmworkers have been displaced by a new agricultural economics.

The Karoo Basin was formed in the Jurassic era, at a time when the first great dinosaurs were appearing in Tanzania in Central Africa along with the first small mammals, and dinosaurs were beginning to fly.¹⁵ Africa, at that time, was still connected to South America,¹⁶ Europe, Asia and Antarctica.¹⁷ The end of the global **Karoo Ice Age**, which was named after the glacial [tills](#) found in the [Karoo](#) region of [South Africa](#)¹⁸ was, curiously, hastened by the evolution of a new actor network on the planet: the termites, whose stomachs returned carbon to the air as the greenhouse gas [methane, bringing about a period of global warming](#).¹⁹

For shale gas drillers, the major area of interest is in the Ecca Group of shales, in the southern Karoo, where methane is concentrated, and of which South African holdings are estimated to be the fifth largest in the world.²⁰ However, the shale

¹⁴ Council for Geoscience, http://www.geoscience.org.za/index.php?option=com_content&view=article&id=1913:shale-gas-cap-rocks-to-in-the-karoo-basin&catid=290&Itemid=162, accessed, 6 September 2014.

¹⁵ Douglas Palmer and Peter Barrett. 2009. *Evolution: The story of life*. London: Octopus Publishing Group, pp. 110-178.

¹⁶ Thomas Branch, Oliver Ritter, Ute Weckmann, Reinhard F. Sachsenhofer and Frank Schilling. 2007. The Whitehill Formation – A High Conductivity Marker Horizon in the Karoo Basin. *South African Journal of Geology*, 2007, Volume 110 Page 465-476, p. 467

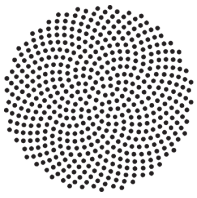
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¹⁷ Wikipedia, "Karoo Ice Age", http://en.wikipedia.org/wiki/Karoo_Ice_Age, accessed 6 September 2014.

¹⁸ Wikipedia, " Geologic time scale", http://en.wikipedia.org/wiki/Geologic_time_scale#Terminology, accessed 6 September 2014.

¹⁹ This paragraph is loosely edited from the Wikipedia article "Karoo Ice Age" as cited above and needs to be proofread against the original to show exact original wording.

²⁰ P D Vermeulen. A South African perspective on shale gas hydraulic fracturing. Paper presented to the International Minewater Association, 2012. Bloemfontein: Institute for Groundwater Studies, University of the Free State. https://www.imwa.info/docs/imwa_2012/IMWA2012_Vermeulen_149.pdf.



formations are punctuated by later geological intrusions of volcanic magma, which together with periods of uplift and depression, have rendered the stratigraphy so convoluted that some 14 hot springs spew steaming water from the depths of the earth. The implication: water, here, flows upwards.²¹ Conversely, rain-water recharge of the aquifers, is known, but not understood. This complex hydrogeological cycle is a central concern, for if there is a crack in one of the thousands of cement casings of fracking wells that will extend between two and five kilometres under the surface, the pollutants may flow upwards to contaminate ground water. If there is a spill in one part of the Karoo, aquifers far away risk being polluted into perpetuity.

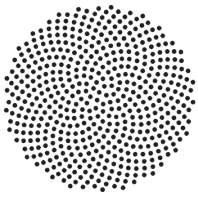
"Give us evidence!" is the argument of the fracking lobby. A Duke University study highlighted four areas of concern in regards to water management in the US-based fracking industry, based on analysis of published data: "stray gas contamination, surface water impacts ... and the accumulation of radium isotopes in some disposal and spill sites." The study notes, however, that "The direct contamination of shallow groundwater from hydraulic fracturing fluids and deep formation waters by hydraulic fracturing itself, however, remains controversial." The evidence, in other words, was unclear to the scientific community. Through the work of the Supreme Court of Pennsylvania²² the media, and the social sciences, it has become increasingly evident that the evidentiaries of science were being systematically compromised by the oil companies. The cover for "fracking denialism" was blown in a release, in August this year, by the Pennsylvania Department of Environmental Protection,²³ which noted 243 instances of contamination of private water supplies by fracking activities between 2007 and 2014, many of which included the contamination of multiple water points. That is roughly 35 accidents per year, or about 3 per month, and that is in only one State.

²¹ Gerrit van Tonder, references to follow.

²² Robinson Township v. Commonwealth of Pennsylvania 2013 WL 6687290 (Pa. 2013).

²³

http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/Determination_Letters/Regional_Determination_Letters.pdf



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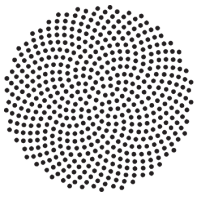
The advertising campaign of Shell South Africa proposes to tap into natural gas and nuclear so “we can keep the lights on when she’s your age”, using an archetype of the consumer-cene: an image of a young bespectacled daughter of the suburban terra reading with a nightlight in her warm cosy bed. Yet fracking proposes to release geologically-stored methane, which in the long term is 40 times more potent than CO₂ in trapping infrared radiation, at a time when alarm bells are ringing in the Arctic and Siberia about permafrost-stored methane from entering the atmosphere, in a place --the Karoo – that is one of the best solar energy sites in the world.²⁴ Shell's archetypical daughter of South Africa might have light, but will she survive the heat?

In the life sciences, new fields have emerged with the suffix "omics", such as genomics or metabolomics. The work in these fields is to think integratively with wholes, across scales and relationalities. Thinking of the Karoo as rock, water, methane, sun, and daughters, and in timescales from the Carboniferous and the Jurassic into colonial history, political ecology-economy and the permanent future, is to begin to develop an omics for an oikological humanities.

II: Cement

In following engineering debates about the disposal of waste water and the design of better well casings to prevent methane from straying out of the drilled shafts that will have a depth that is equivalent to five and a half Table Mountains, it is difficult not to note as an anthropological curiosity what I want to call **the cosmology of cement**: the unshakeable belief that the cement used to line and plug the thousands upon thousands of fracking wells and waste water sites can be trusted, in perpetuity, to withstand the flows of gas, the flows of liquids, and the movement of tectonic plates, and create “extraterrestrial zones” that are out of the flows of the planet itself forever. Perhaps *the* artefact of modernity, cement exemplifies a belief in an extraordinary human power to hold terrestrial forces at bay; that it will hold toxic water permanently out of hydrogeological processes; and that it will be immune to all **states of matter** and all

²⁴ See Anton Eberhard, Joel Kolker, and James Leigland, 2014. Renewable Energy IPP Procurement Program: Success Factors and Lessons. Washington DC: Public-Private Infrastructure Advisory Facility (PPIAF), World Bank.



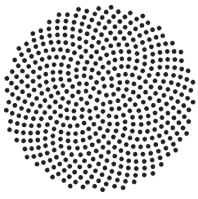
matters of state – in revolutionary uprisings or wars in which toxic facilities could be targets. In every sense, cement is a magical substance in a cosmology, pervasive in modernity, that engineering can and will come up with a way of keep fracking water or nuclear waste out of hydrological cycles and tectonic processes, and that states simply need to "regulate it". The belief in the power of cement confers upon humans the power to enact upon the earth the transformation of liquid to solid; the division of economy from ecology; the separation of human activity from ecological and planetary systems. Outside of space and outside of time, cement is believed immune to tectonic movement, and impervious to osmosis in perpetuity. Cement, as such, enacts human exceptionalism: the self image of Moderns as denatured; dematerialized; separate from the planet itself. We confront, in the use of cement in fracking, the cosmology at the heart of modernity: Rene Descarte's *Discourse on Method, Optics, Meteorology and Geometry* in which the thought of those ancient indigenous scholars – Euclid and Pythagoras – was remade as the foundation of a way of producing a metrics of space – geo-metry – separated from the human person: the cogito whose being is related to thought and ideas, independent of space or time or context.

The Earth made in the image of modernist thought is a world made of Platonic and Archimedean solids, nortthe thought of the ancient Chinese, for whom the geometry of the world ought to have been understood in flows and propensities,²⁵ nor that of Amerindian thought in which the world is not abstract space but made by movements of interacting bodies.²⁶

Both Husserl and Derrida wrote their first books on geometry, finding in the abstract production of metrics of space the beginning of the problem with philosophy of self. Together with Michel Serres, they call for a different way of doing geo-metrics,

²⁵ Francois Jullien, *The Propensity of Things*

²⁶ See Lesley Green and David Green, 2014. *Knowing the Day, Knowing the World*, ch.4 Tucson: Arizona University Press.



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measuring earth and space in ways that open ourselves to living in the planet; an ethical way of calculating, measuring, and engineering our presence in space, and in time.²⁷

III Becoming Human in the Anthropocene

This leads me to a question: What might it mean to be human in the anthropocene, which is the product of a philosophy that has extracted human relations from the earth? I have had the privilege, in the past 5 years, of working with graduate researchers who have sought to grasp everyday ecological philosophies in different parts of Southern Africa. The major finding of the project is the ways in which regional ecological thought is tied in to what it is to be human.

Chris Mabeza²⁸ for example, describes the work of a farmer named Zephaniah Phiri-Maseko who managed to create an oasis with a small spring in a dry area of Zimbabwe, with a philosophy of the **marriage of water and soil**: in which the soil itself is part of the extended household, bound in to the fecundity of that household, and its births and deaths in the burial of ancestors and umbilical cords.

Josh Cohen²⁹ describes the ways in which plant medicine in Namaqualand focuses on using plants for strengthening energy, vitality and wellbeing, rather than on a form of plant medicine that enables combative relationships with viruses, bacteria and fungi.

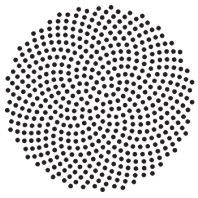
Artwell Nhemachena³⁰ describes the idea of *chivanhu* – which translates as "the ways of human beings" – as a resource for surviving intense state violence the objective of which has been to destroy the protesting subject; he explores the ways in which aspects of *chivanhu* such as *kukumbira* (to request or petition), *mhepo/mweya* (wind/air/breath), *ukama* (relationships of interdependence), *kutenda* (to thank) and to sense (*kunzwa*) played out in the modes of survival among the villagers.

²⁷ See also David Rapport Lachterman, 1989. *The ethics of geometry: A genealogy of modernity*. London: Routledge.

²⁸ Christopher Mabeza, PhD dissertation.

²⁹ Joshua Cohen, PhD dissertation.

³⁰ Artwell Nhemachena, 2014. PhD dissertation.



Their work and that of others³¹ begins to point back to the *oikos* -- a way of thinking about ecology, economy, and *ecumene* jointly, all words which are derived from the Greek word *oikos*, a household. What is significant in all of their work is that land is not reducible to "questions about productivity, efficiency, yields, inputs and outputs, [and] farm labour"³² – rather, water, soil and air are part of humanity, part of personhood. It is striking that these eco-sophical resources are coming from non-Annex countries: those who are not bound by Kyoto. The stark irony with which we must grapple is that the non-Annex countries, like South Africa, have declined to take a lead in offering different intellectual heritages in which we could begin to rethink what it means to be human in an earth that faces climate catastrophe. I am hopeful that in our dialogues this week, here in Rio de Janeiro, we might strengthen the possibilities for the fragile intellectual heritages of the non-Annex countries in particular, to make their contribution in the development of a kind of politics that takes life itself as a central concern.³³

How might some of these ideas work in the precarious Karoo? "Poisoning is easy, but nurturing is a craft", reminds Isabelle Stengers.³⁴ Land redistribution is a central task of the post-apartheid government, and one that has been slow to take form. Land redistribution with poisoned wells would heap cruelty upon cruelty. One cannot improve an economy and equalise an *ecumene*, in a toxic ecology. A game-changing politics, here, would be decision-making with people, with soil, with water, with winds, with colonial history, the sun, the Arctic and Siberia in mind. Is such a politics of life possible?

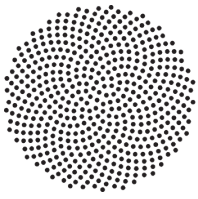
Dominic Boyer's observation that the fossil economy is fossilised is apt in South Africa, which is reliant on a single centralised energy provider that is dependent on

³¹ Munya Mawere, 2014. PhD dissertation.

³² James Ferguson, 2013. How to Do Things with Land: A Distributive Perspective on Rural Livelihoods in Southern Africa. *Journal of Agrarian Change*, Vol. 13 No. 1, January 2013, pp. 166–174.

³³ See Steven Healy, 2014. The biopolitics of community economies in the era of the Anthropocene, in Burke, B.J. and B.W. Shear (eds.) 2014. "Non-capitalist political ecologies", special section of the *Journal of Political Ecology* 21: 127-221.

³⁴ Isabelle Stengers, reference



THE THOUSAND NAMES OF GAIA

from the Anthropocene to the Age of the Earth

coal and nuclear, and characterised by inefficient long supply chains.³⁵ A post-fossil future³⁶ demands a new political ecology of energy:³⁷ short supply chains; many power production centres; the pluralization of energy futures with interlinked energy producers;³⁸ the democratization of energy debates.³⁹ That kind of game-changing renewable energy economy is already partly sketched out by a number of energy researchers in South Africa.⁴⁰ "Mining the sky" is the logo of one of the solar companies working to set up large solar energy plants in South Africa – working with today's energy, today, instead of mining the solar energy that is stored in the earth from the years before the dinosaurs.⁴¹ Current solar farms in South Africa already produce the equivalent of half

³⁵ Dominic Boyer, citing Hermann Scheer, in "Energopolitics and the Anthropology of Energy", *Anthropology News* May 2011, p. 5. https://anthropology.rice.edu/uploadedFiles/People/Faculty_and_Staff_Profiles/Boyer_Documents/Energopolitics%20AN.pdf

³⁶ See Anton Eberhard, Joel Kolker, and James Leigland, 2014. Renewable Energy IPP Procurement Program: Success Factors and Lessons. Washington DC: Public-Private Infrastructure Advisory Facility (PPIAF), World Bank.

³⁷ See David Fig, 2013 'Hydraulic Fracturing in South Africa: Correcting the Democratic Deficits' Pp. 173-194 in J. Daniel, P Naidoo, D Pillay and R Southall (eds), *New South African Review* 3. Johannesburg: Wits University Press.

³⁸ From a report titled *Photovoltaic Electricity: The localisation potential of Photovoltaics and a strategy to support the large-scale roll-out in South Africa*, prepared for SAPVIA, WWF and the DTI: "The development opportunity in the utility-scale PV market segment is

significant in South Africa considering the high irradiance observed in the country. Other drivers that create the potential in the market (and to other market segments) include, inter alia:

South Africa (SA) has good solar resources and this is predominant in areas that have low population densities

SA is not faced with space restrictions that affect some other countries, specifically Europe

There is an increasing demand for power in the country

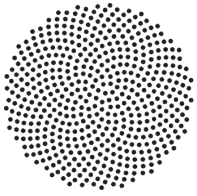
Good business opportunity, as South Africa is seen as the gateway to Africa with a potentially emerging market

However, the growth of the utility-scale PV market is entirely reliant on the government's policy and specifically the REIPPP, which limits the total installed capacities that can be established in South Africa within this market segment.

³⁹ See David Fig, 2013 'Hydraulic Fracturing in South Africa: Correcting the Democratic Deficits' Pp. 173-194 in J. Daniel, P Naidoo, D Pillay and R Southall (eds), *New South African Review* 3. Johannesburg: Wits University Press.

⁴⁰ See for example Lucy Baker and Holle Linnea Wlokas, 2014. *South Africa's Renewable Energy Procurement: A New Frontier*. Tyndall Centre for Climate Change Research Working Paper 159.

⁴¹ [These figures need to be checked:] Koeberg Nuclear Power Station produces 13,668 GWh per annum on average via two reactors



of one of the country's two nuclear reactors, at a fraction of the cost. That project could be strengthened by a change of policy to remove current caps on the amount of renewable energy that may be produced; by investing in an energy infrastructure that could take feeds into the national grid from many places, and by drawing on African intellectual heritage about the relations of water, soil, sun, breath, and humanness as the basis of land redistribution in a reparative oikology in the energy-hungry anthropocene.

The Karoo offers an average performance of 6kWh per square metre per day x 365 = 2190kWh per sq metre per annum

13 668 000 000 kWh / 2190 kWh = 6241095 m² to match current nuclear output

Square root of that = 2498 m x 2498 m under solar would match current nuclear output