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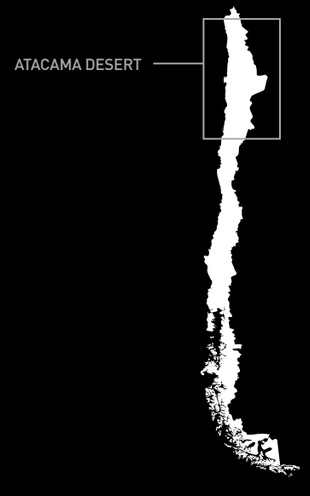
DESERTA

Pedro Ignacio Alonso Zúñiga



The present work collects and extends arguments contained in the book *Deserta: Ecología e Industria en el desierto de Atacama*[1].

The photograph of Reyner Banham dressed as a cowboy and riding a small-wheeled folding bicycle across a Californian salt flat is one that has captivated architectural audiences for quite some time. A couple of years ago, while starting an investigation that would focus on Chile's Atacama desert, we couldn't help but imagine ourselves remaking this image, riding an identical *Bickerton* bike through the Atacama's own dried salt lakes, both as a homage to Banham and as a somewhat delusional way to legitimise the whole endeavour.

Reyner Banham, riding his Bickerton over Silurian Lake, California, 1981 © Tim Street-Porter.

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Rodrigo Pérez de Arce, riding a Bickerton over the Tebenquiche salt lagoon, Atacama, Chile, 2011 © Tim Street-Porter. PUC/AA Visiting School to the Atacama Desert.

Thomas Weaver, riding a Bickerton over the Tebenquiche salt lagoon, Atacama, Chile, 2011 © Tim Street-Porter. PUC/AA Visiting School to the Atacama Desert.

Pedro Alonso, riding a Bickerton over the Tebenquiche salt lagoon, Atacama, Chile, 2011 © Tim Street-Porter. PUC/AA Visiting School to the Atacama Desert.

Pilar Cereceda, riding a Bickerton over the Tebenquiche salt lagoon, Atacama, Chile, 2011 © Tim Street-Porter. PUC/AA Visiting School to the Atacama Desert.

We tried to resist the poetic lure of this powerful landscape and the consideration of the Atacama Desert as containing the original, sublime, unadulterated conditions of the planet. On the contrary, our interest came from it as a worst-case scenario: constrained by scarcity of water and energy, located in the driest desert in the world[2], within the oldest hyper-arid zone on Earth[3], under the world's most extreme weather conditions[4], in the region with the highest rate of direct solar radiation in the world (9kWh/m2/day), in relative isolation and associated with productive activities of considerable environmental impact, it seemed to offer, even if for pure methodological reasons, a perfect laboratory for exploring architecture and technology from the strangely alluring image of Banham discovering his equivalent America Deserta. He was, after all, echoing Charles Doughty's classic, *Travels in Arabia Deserta* (1888). We hoped that the extreme landscape of northern Chile would allow us to enter this tradition, and so we named the project *Deserta.* From our Travels, and the Scenes, we have sought to make the Atacama *Deserta* a testing ground for exploration and to complete – in retrospect – a three-fold sequence with Doughty and Banham.

And while we were aware of the historiographical spirit behind the remaking of this photograph, we also simply wanted to indulge in the absurdity of riding a bike on the desert floor, feeling the salt under the rolling wheels, just as Banham had done 30 years before when writing:

"Swinging in wider and wider circles or going head down for an ever-retreating horizon, the salt whispers under one's wheels and nothing else is heard at all but those minute mechanical noises of the bike that are normally drowned out by other traffic. Swooping and sprinting like a skater over the surface of Silurian Lake, I came as near as ever to a whole-body experience equivalent to the visual intoxication of sheer space that one enjoys in America Deserta."[5]

With rhapsodic passages like this in mind we kept telling ourselves that for Banham the desert floor was the field–or *cancha* - for the combination of space and experience and the technologies implicit in the small mechanism of the bike, almost as if revealing the first evidence of a conjoined human and mechanical existence. The image, in this sense, offers a rival to another, more longstanding, illustration of architectural beginnings. But, unlike Charles Eisen's ubiquitous engraving of the Abbé Laugier's primitive hut, Banham's equally contrived image travelled as far as possible out of the idealised forest into a diametrically opposed desert ground.[6] By occupying the smallest and lightest architectural construct (deliberately heightening the provocation of offering something as simple as a bicycle as a symbol of perfect architecture) he was subverting not only paradigms of architectural permanence but also the writing of architecture – conceiving his book as an image (or Scene) in *America Deserta* (1982), in which the text becomes the image and the image transforms itself into the text.

Back in Atacama, the combination into a single frame of Banham, the desert, and the smallest architectural construct, compelled us to extend the desert concept to towns, urban settlements, and their architecture, because it comprises 'all' that is subjected to the constraints imposed by the desert ecosystem as all things are intertwined through their competition

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1 Santiago: ARQ, 2012. One of the author's essays in the book was written in collaboration with Thomas Weaver, and originally published as *Deserta*, in AA Files 62. The book is the result of a joint collaboration between the university's Architecture School and the *Atacama Desert Centre* (CDA) comprising two design studios (2009 and 2010), an international seminar entitled *Extreme Weather* (2009), and two international workshops that included the participation of Pablo Lazo (Arup, 2009) and *The Architectural Association's School of Architecture* (in 2011).

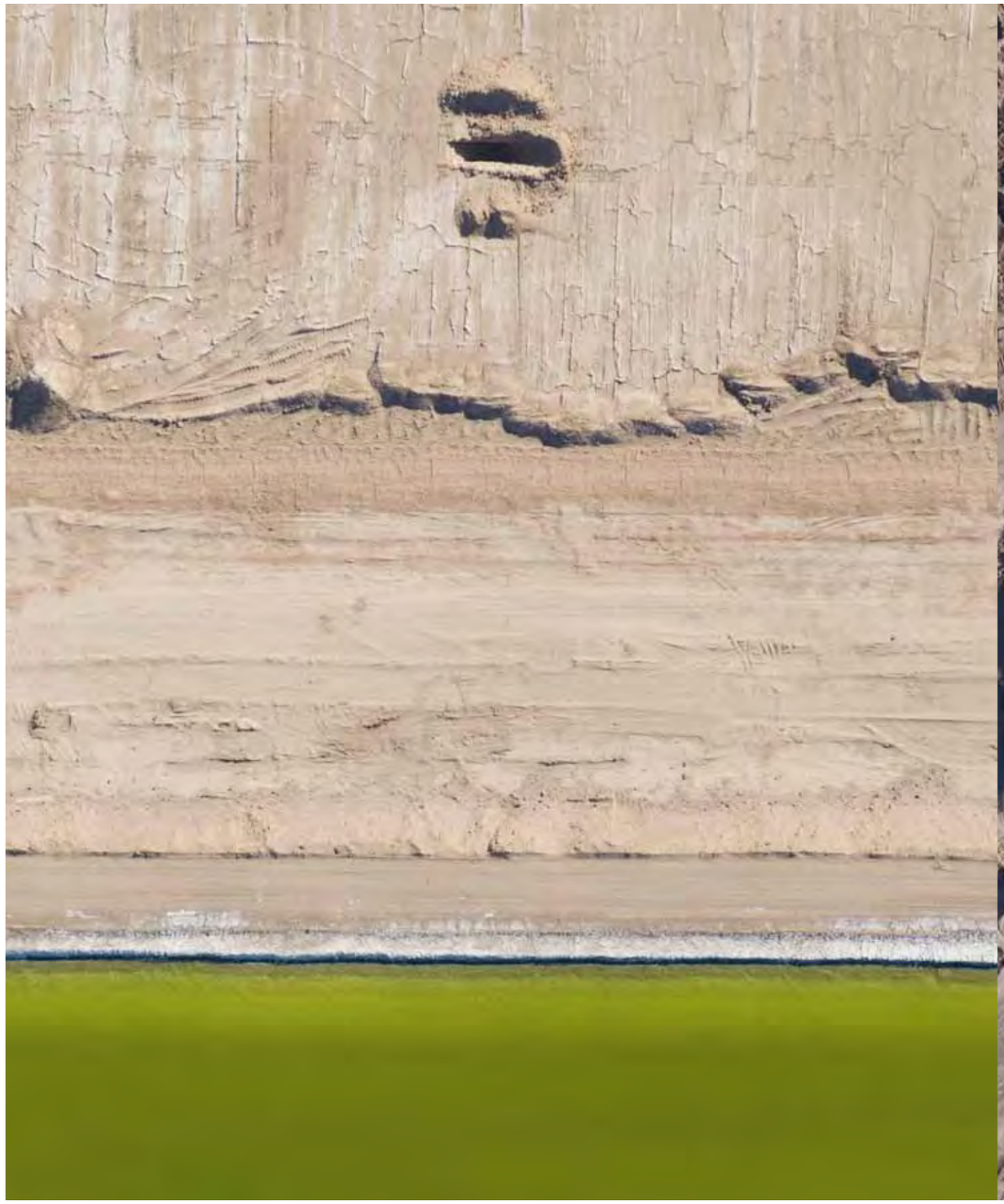
2 Jonathan Clarke, *Antiquity of aridity in the Chilean Atacama Desert*. In: "Geomorphology", Vol. 73, N° 1/2: 101-114.

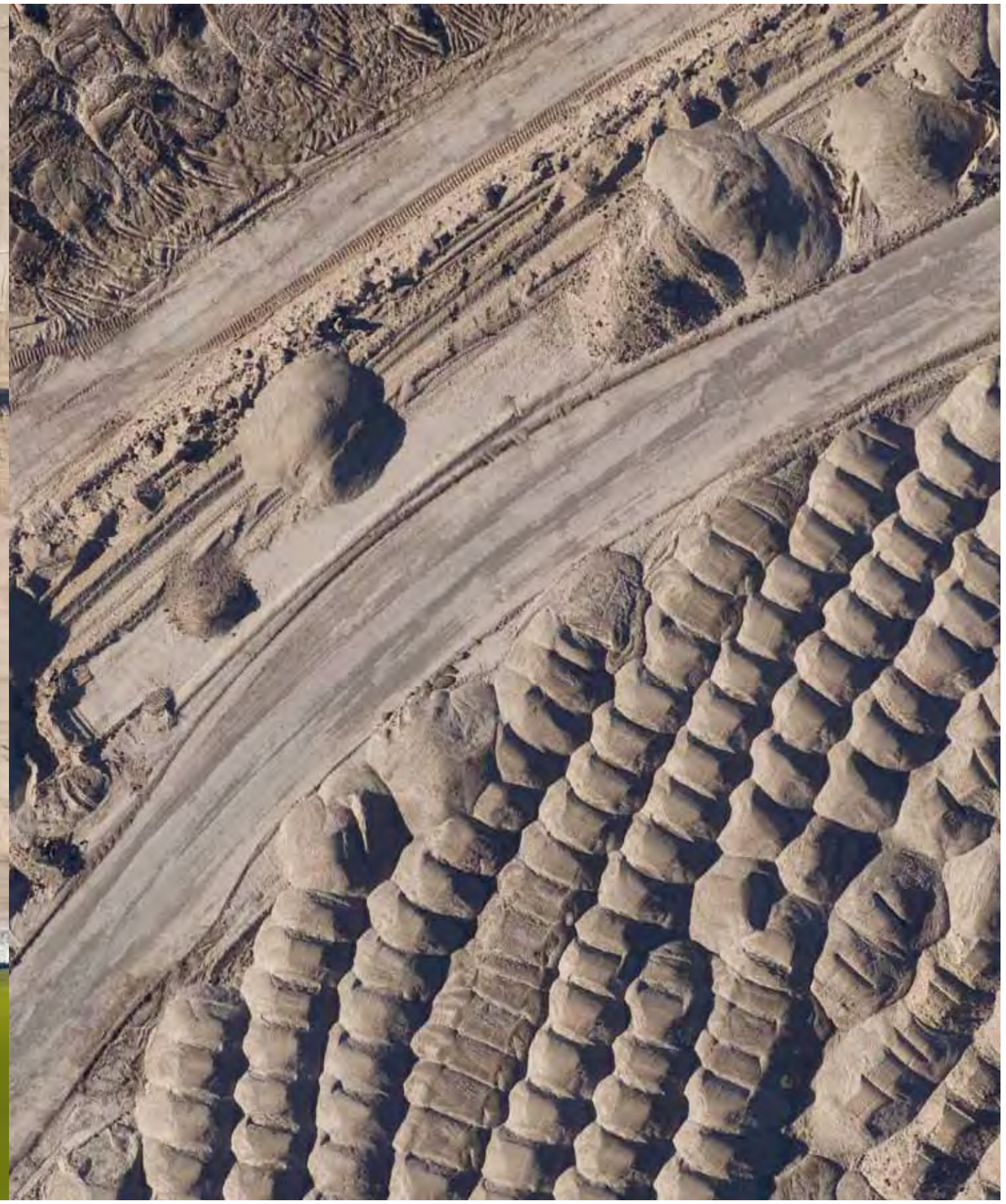
3 T.J. Dunai, G.A. González López, and Joaquím Juárez-Larré. *Oligocene-Miocene age of aridity in the Atacama Desert revealed by exposure dating of erosion-sensitive landforms.* In: "Geology", Vol. 33, N°4: 321-324.

4 Wolfgang Weischet, *Las Condiciones Climáticas del Desierto de Atacama como Desierto Extremo de la Tierra*. In: "Norte Grande", Vol. 1, N° 3/4 (March - December 1975), Instituto de Geografía, Pontificia Universidad Católica de Chile, Santiago, Chile: 363-373.

5 Reyner Banham, *Scenes in America Deserta* (London: Thames & Hudson, 1982), p. 99.

6 As the art critic Boris Groys has described it, the 'desire to get rid of any image can only be realised through a new image: the image of a critique of the image' – a sentiment that itself was a reworking of Roland Barthes' observation that 'the best weapon against myth is perhaps to mystify it in its turn, and to produce an artificial myth'.





for the same water, energy and so-called 'natural resources.' This includes not only the desert ecosystems and trophic webs, but also industries, industrial production and their metabolic functions, and underscores the idea contained with Banham's image that within a contemporary discourse it is no longer possible to draw clear-cut distinctions between nature and our technological culture.

This argument is not new. In a text introducing the exhibition *Art and Architecture for a Changing Planet*, art curator Francesco Manacorda presents us with the idea that in Western civilization; 'nature and culture' have traditionally been presented as a binary opposition. He explains that while on the one hand we have the 'original, unadulterated conditions of the planet,' on the other hand we have 'man's technological and cultural progress.' According to Manacorda, this dualistic way of thinking "arrives in the present via the 18th-century philosopher Jean-Jacques Rousseau's idea of the blissful state of nature that instigated the romantic ideal of idyllic nature".[7] Marshall Berman reminds us that Rousseau was also "the first to use the word moderniste in the ways in which the nineteenth and twentieth century's will use it".[8] We find the same dualism in Claude Lévi-Strauss's definition of anthropology as the discipline that investigates the relationship between nature and culture. According to Manacorda, one of the most dangerous side effects of this two-fold opposition is the segregation of nature into a separate space, remote from mankind, everyday life and culture, and totally disconnected from our responsibilities and actions. It goes without saying that this *romantic/modernist* distinction has for a long time been subject of critical reassessment.

Robert Smithson's legendary fascination with geology and industrial alterations on the earth's surface by bulldozers well exemplifies this tradition, where he insisted in the necessary dialectic between mining and land reclamation. According to him, the artist and the miner must become conscious of themselves as natural agents, art becoming a physical resource mediating between the ecologist and the industrialist.[9] When the miner loses consciousness of what he is doing, Smithson explains, he cannot cope with his own inherent nature or external nature.[10] His 1971's *Wandering canal with Mounds*, or his own interest in Robert Morris' proposal for an *Earth Mound*[11] exemplify his understanding of the potential of using vast portions of land as a material support for his sculptures.[12]

Therefore, far from presenting a pure, pristine and unadulterated surface, the image of one's wheels swooping and sprinting over the surface of a salt lake was only part of a larger context that includes issues of land reclamation that would turn the horizontal flats into a quite a vertical problem, from the depths of subterranean water tables and mine or the importance for astronomy of dark sky conservation as it reacts to the dust and lights of industrial operations. These also embrace one of the most striking features of the Atacama Desert in the man-made mountains resulting from the mining activity: slag heaps in permanent growth by the action of trucks or mechanic spreaders pulling out inert material from the mineral quarries.

Ignacio Infante's photographs of the desert ground taken from the air show the grain, colour and texture proper to the fabrication of such topographies. The pictures evidence the manner in which these are carefully planned structures, designed and managed. And while they can be of three different kinds, according to their treatment, composition, distance to the quarry and environmental liability: *tailing, heap leach, and waste pile*,[13] the last two kinds are relatively safer and more stable and remain as close as possible to the mining operation in order to reduce the amounts of transportation needed. In fact, purely economic reasons indicate that highly consuming trucks should never stop their engines, while at the same time endlessly making the shortest possible loops from the mine to the heap in order to maximize efficiencies. This rationale is clear in the case of the town of Chuquicamata, an urban settlement that was closed down, if only to be buried below the growing pile of mining waste. Taking the entire population to another nearby town was cheaper than removing the material increasing far and high around the exiting waste tracks.

Ignacio Infante's aerial views show that the two main ways to 'make up' a mountain –by using trucks or by deploying mechanic *open cast mine spreaders*– produce different and characteristic surface patterns. While trucks operate by pilling up mounds from the amount of material they can carry, mechanical spreaders have been developed as the last element of the conveying line for dumping the overburden on the exterior and interior dumps of the mines.[14] The former makes a grainy texture; the later becoming sequences of radial fishbone-like structures. Their growth, from the inside to the outside, reminds us of crystal growth, connecting, as it were, micro and macro scales and the natural with the artificial (or rather blurring the boundaries between such distinctions). It brings us back to Smithson's interest in geology as it was distinctively connected with his interest in crystals, which he defined as a solid bounded by symmetrically grouped surfaces.[15]

The similarity between crystals and the growth of slag mounds might not be casual. According to Charles Bunn, crystals "...hold within themselves the keys to an understanding of the solid state of matter and the way in which atoms and molecules are held together in rigid structures."[16] They are composed of particles stacked in regular array, closely packed upon ranks to form solid internal regular patters.[17] Fascinated as he was with crystals for scientific and aesthetic reasons, Bunn tells us that when crystal nuclei are formed (just as slag heaps in Atacama) "they grow outward, steadily increasing in size."[18] As pointed out by Georges Teyssot "Smithson borrowed a number of motifs from the manuals of crystallography he was collecting, where systems of growth through molecular accretion were described."[19] Teyssot explains that for many artists and architects of the 1960s "crystallography, symmetry and dissymmetry, and mirror effects, were all devices offering clues about the conditions in which topology operated."[20] Slag mounds (much in the sense Gilles Deleuze will use Gilbert Simondon's analysis of crystal formation to redefine time and events) "grow out of the edges, or in the edge,"[21] and in creating new geographies for the desert, a very particular time –faster that geological time– plays a role in the growing of waste piles from the inside to the edge and in the edge, characterizing the crystal-like growth of man-made mountains in Atacama.

But despite of these facts, little is known about such massive structures. They seem too artificial to become matter of interest for geographers, or too natural to be relevant for architects or urban planners. Smithson himself reflects upon the fact that there is very little consideration in terms of what the landscape looks like after the mining operations are completed. So "a kind of blindness ensues."[22] Perhaps because crystals are stubbornly considered connected to transparency, the slagheaps of Atacama still remain invisible to our sight, despite of their visual, cultural, economic, and environmental presence.

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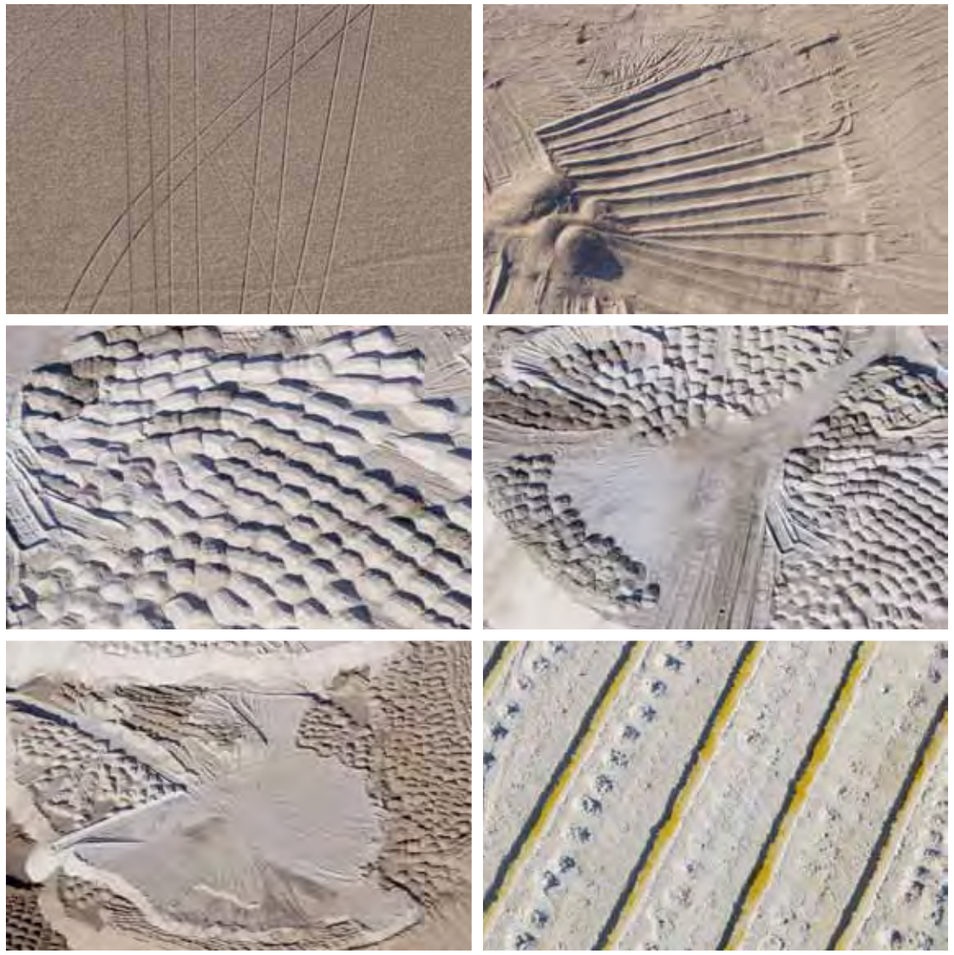
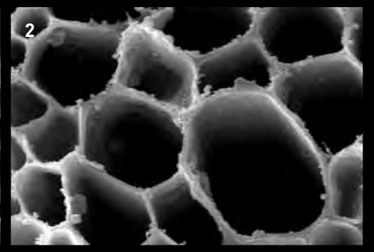
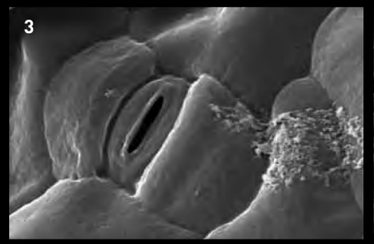
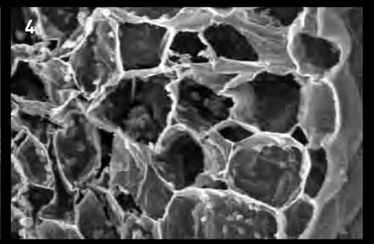
7 Francesco Manacorda, *There Is No Such Thing as Nature*. In: "Radical Nature: Art and Architecture for a Changing Planet 1969-2009" (London: Barbican Art Gallery/Koening Books, 2009), p.9.
8 Marshall Berman, *All that is Solid Melts into Air: The Experience of Modernity* (London: Penguin, 1982), p.17.
9 Robert Smithson, *Untitled*, 1972, in: Nancy Holt (ed.), "The Writings of Robert Smithson: Essays with Illustrators" (New York: New York University press, 1979), p. 220.
10 Robert Smithson, *Untitled*, p. 220.
11 Robert Smithson, *Aerial Art*, in: Nancy Holt (ed.), "The Writings of Robert Smithson: Essays with Illustrators" (New York: New York University press, 1979), p. 93.
12 Francesco Manacorda, *There Is No Such Thing as Nature*. In: "Radical Nature: Art and Architecture for a Changing Planet 1969-2009" (London: Barbican Art Gallery/Koening Books, 2009), p.10.
13 These can be of three kinds. 1) Heap Leach: made out of the rubbles of oxidized copper. It contains very small quantities of water and is composed by material no bigger than 1 inch. This heap also contains metals or chemicals used in the lixiviation process; 2) Waste Pile: artificial mound composed by the accumulation of overburden waste rock or the materials overlying an ore or mineral body that are displaced during mining without being processed. These contain large rocks and have major visual impact and dust contamination; 3) Tailings: composed by the sub products of the mining process in a mixture of very thin sand, large quantities of water and various chemicals and waste minerals. Mine tailings are usually produced from the mill in slurry form (a mixture of fine mineral particles and water). This kind of structure grows out of the accumulation of wet material by the setting of a previously constructed dam. It is complex because of its mineral and chemical composition, as well as its content of water that makes it to behave as a liquid mass, bringing structural instability and the possibility for the remaining chemical contents to reach underground water tables. For these reasons tailings are often the most significant environmental liability for a mining project, and are built as far as possible from both the mining operation and urban settlements.
14 See, for instance, *ThyssenKrupp Fördertechnik* http://www.tk-mining.com/spreaders_2nd_level.html.
15 Robert Smithson, *Entropy and the New Monuments*, in: Nancy Holt (ed.), "The Writings of Robert Smithson: Essays with Illustrators" (New York: New York University press, 1979), p. 17.
16 Charles Bunn, *Crystals: Their Role in Nature and Science* (London: Academic Press, 1964), p. V.
17 Charles Bunn, *Crystals: Their Role in Nature and Science*, pp. 7-11.
18 Charles Bunn, *Crystals: Their Role in Nature and Science*, p. 32.
19 Georges Teyssot, *Time-Crystal: Information and Entropy*; in: Alessandra Ponte (ed.) "Entropic Territories," Architecture and Ideas Vol. XI (Montreal: Ai Press, 2011), p. 74.
20 Georges Teyssot, *Time-Crystal: Information and Entropy*; p. 76.
21 Gilles Deleuze, *The Logic of Sense* (1969), trans. Mark Lester, Charles Stivale, Constantin V. Boundas, ed. (New York: Columbia University Press, 1990), p. 9.

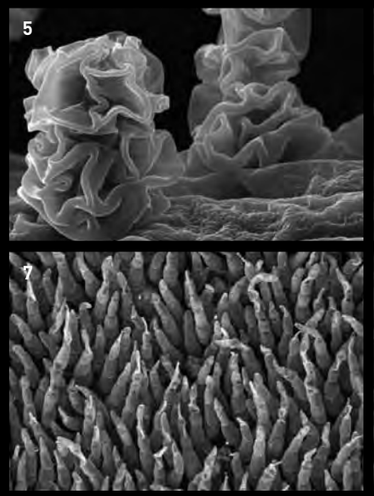


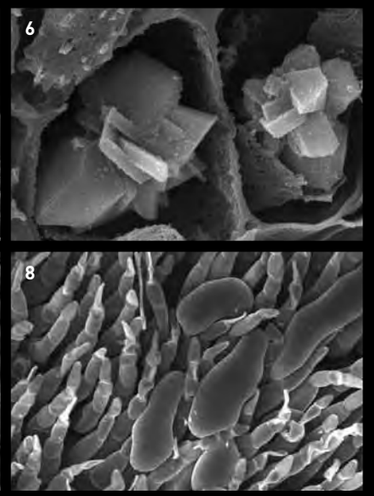
Series of aerial shots taken by Chilean photographer Ignacio Infante overflying the surrounding area of María Elena on an engine paragliding.





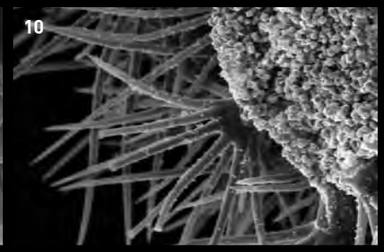


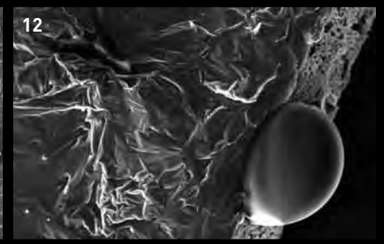


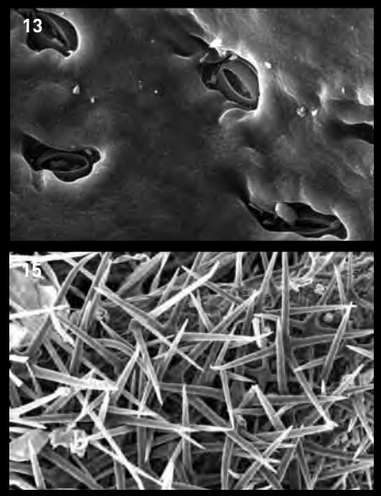


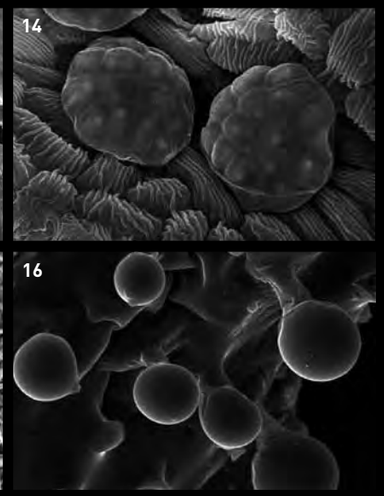
Ana María Mujica, Collection of pictures illustrating the survival mechanisms, anatomy and morphology of Chilean xerophyte plants. Scanning electron micrographs of desert plant leaves.

1 ~ CRISTARIA MOLINAE GAY. Zoom: 4020x. Rough foliar epidermis Stomata, exuding salt. Endemic perennial herb of abundant flowering that grows in the coastal Mountains desert of Niebla, at an altitude of 800 metres. / **2 ~ SARCOCORNIA FRUTICOSA.** Zoom: 2560x . Parenchymatous caulomatic cells. Native succulent Angiosperm of extensive geographic distribution in Chile (Region II – V). Belongs to a species that forms monospecific communities in the saline floors of the Atacama Salt Flats (2300msnm). / **3 ~ CISTANTHE PICTA.** Zoom: 2580x. Foliar epidermis Stomata. A type of succulent leaf that stores water, frequently found in rocky terrain of the Andes and sub-Andes. / **4 ~ VALERIANA ATACAMENSIS.** Zoom: 650x. Aquifer parenchyma of foliar mesophyll. A perennial endemic herb that grows between 0 and 1000 msnm in the coastal Desert of the II, III, and IV Region of Chile. / **5 ~ CRISTARIA MOLINAE GAY.** Zoom: 2800x. Foliar glandular trichomes that store water and salts. / **6 ~ SARCOCORNIA FRUTICOSA.** Zoom: 8530x. Salt crystals in the interior of a parenchymatous stem cell. A species that inhabits the interior desert. / **7 ~ TESSARIA ABSINTHIOIDES.** Zoom: 540x. Pluricelullar (hairs) epidermis trichome that protects against Hervibora. A species of ample geographic distribution that inhabits the interior desert. / **8 ~ TESSARIA ABSINTHIOIDES.** Zoom: 680x. Resin secreting trichomes, product of the secondary metabolism of the plant. A shrub species that has been long used by the people of Atacama for saddle making.









9 ~ OXALIS HYPSOPHILA PHILL. Zoom: 750x. Foliage epidermal cells that store water. Perennial herb of glandulous leaves. Grows between rocks and on ground at an altitude of 2000 metres in the Andes Mountains (High Desert) of the III Region of Chile. / **10 ~ SOLANUM PULCHELLUM.** Zoom: 1130x. Stellar trichome foliar epidermis with crystals of salt, a perennial herb with soft, meaty leaves. It grows in the XV Region of Chile in the High Desert of the Andes Mountains at an altitude of 2500 metres. / **11 ~ AZORELLA COMPACTA.** Zoom: 2980x. Stoma hidden underneath a thick, compacted layer of wax with lignin, complex polymer whose epidermis of the exterior leaves stops excessive water loss. Azorella is an extremely fibrous camefita plant of slow growth found at an altitude of 4000 metres in the High Desert of the Andes Mountains. / **12 ~ PLAZIA DAPHNOIDES.** Zoom: 1830x. Transversal cut through leaf in which a drop of oil con be observed, these oils correspond to a component of the secondary metabolism of the plant and is possibly used to protect against Herbivoria. Fibrous scrub grows in the interior High Desert of the Andes Mountains at an altitude of 3500 metres. / **13 ~ AZORELLA COMPACTA.** Zoom: 1650x. Foliar epidermis Stomata. / **14 ~ HAPLOPAPPUS RIGIDUS.** Zoom: 1980x. Foliar glandular trichome epidermis that store water. / **15 ~ CRISTARIA MOLINAE.** Zoom: 780x. Stellar protection trichome. / **16 ~ CALCEOLARIA INAMOENA.** Zoom: 1900x. Foliar glandular trichomeepidermis that store water. An evergreen shrub that grows en the high desert, between 3500 and 3800 m on the Andes Range.

But we know that the term crystal no longer designates transparent solids in general, but solids that, whether transparent or opaque, show in their natural state the flat faces and the symmetry, which appeared to be characteristics closely related to their inner structure.[23] The question thus remains as to whether such novel topographies are to be considered objects of shame, or rather tokens of our capacity to create man-made environments. It means to accept the task of rendering these newly made mountains visible through representation in order to turn the architect, as much as the artist, the engineer and the businessman, conscious of themselves as agents of large-scale territorial transformations beyond useless distinctions between the natural and the artificial.

In *The Politics of Nature: How to Brings the Sciences into Democracy* (2004) and by implying the notion of '*political ecology*', Bruno Latour goes further in discussing the struggle between nature and our technological culture by proposing an end to this old dichotomy. He sets forth the argument that "political ecology has nothing at all to do with '*nature*'—that blend of Greek politics, French Cartesianism, and American parks".[24]

This statement might seem striking, in particular considering that the category of nature still remains fundamental to architectural discourse. Implicitly, Latour's argument rejects Rousseau's blissful 'State of Nature' and Lévi-Strauss's idea of anthropology and argues that the segregation of nature into a separate space has become a huge obstacle because any public discourse inherent in any notion of culture is constantly threatened by the notion of and outside a sublime and undeniable nature.[25] He would say, in conclusion, that "nature is not a relevant issue for ecology: on the contrary, ecology dissolves the boundaries of the notion of nature and then redistributes their agents".[26] Therefore, it could be said that the category of nature is in fact opposed to ecological thinking.

As it were a twenty-first century contribution to Claudio Gay's Atlas, we have developed a cartographic survey of the often-dismissed features of such man-made geographies by referring to the large-scale layering caused by the stacking of waste materials. This map is necessarily provisional, for as I write, active mining operations keep slag heaps growing and in permanent transformation. By making these mounts visible (and once alleviated from the burdens of a mythical pristine nature) it means to assert that if mountains can be designed and built according to plan.

The whole of the Atacama Desert must be considered (in itself) a project, much in the sense defined by British artist-sociologist John McHale who nearly 40 years ago argued in *The Future of the Future* (1968) that the notion of an industrial ecology should bring economic and industrial systems in close relation to technology. According to him, we need to conceptualize our global, man-made environ facilities and industrial systems in terms of models that are not based on simplistic notions of production/consumption.[27] An industrial ecology, he would explain: "as an integrally functioning 'organic' sector within the overall ecosystem".[28] McHale will go further in proposing that the very concept of culture should be used in an inclusive sense to describe a whole system. This should be called 'ecological context' as it encloses and screens all human activity within the biosphere.

And while redesigning an ecology in the Atacama Desert still emerges as a highly utopian goal (despite our capacity to radically transform its geography), it nonetheless sets forward our explorations on the idea of an 'ecological context' subjected to environmental redesign based on the redistribution of agents performed by industrial ecologies within a technological/historiographical path connecting i.e. Banham, Smithson, McHale, and Latour. The ultimate goal of our explorations is thus concerned with the possible redistribution from the point of view of architecture and urban design of the concept of nature through the articulation of technology and infrastructure.

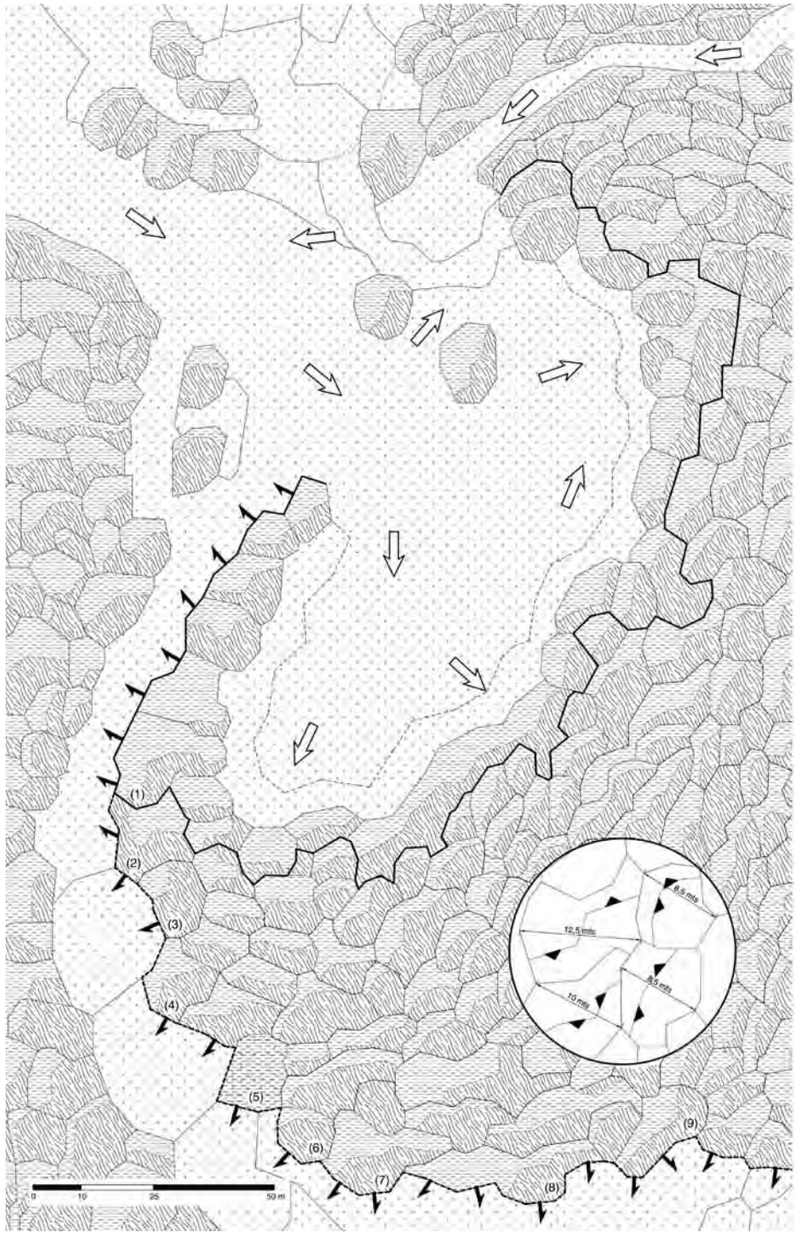
From these observations[29], we have developed images in the form of a triptych. These have been conceived following Bernard Cache's understanding of architecture as the "art of introducing intervals in a territory in order to construct frames of probability."[30] In connection to three different desert ecosystems of *Loma*, *Riparian*, and *Puna*,[31] these images do not seek to represent the project of cities or landscapes, but the introduction and combination of elements into a territory in order to construct the probability for new programs to happen. In other words, they aim at defining, with McHale, an ecological context in order to open up the conditions of existence for projects to come.

This context is designed from the introduction of new agents, disruptive, dirty and transparent (as characterized in the introduction to the book *Deserta*)[32] creating assemblies and associations now deprived from nature as organizing category into a set of relations and hierarchies thoroughly interlocked. Because different projects always have different constraints and requirements (political, geographical, economic), and because they would be set in different environments, there will never be two identical relations between such technologies. In other words, if the desert floor is the *cancha*, then we need to bring together, by design, the right players and their reciprocal relations. The argument follows by proposing that in creating new artefacts, infrastructures, industries, buildings, and organizational structures, design should attempt to specify in advance how and where a disruptive technology will show up in our everyday practices, opening new spaces in which we can work and play. Such design is therefore necessarily reflective and political.[33]

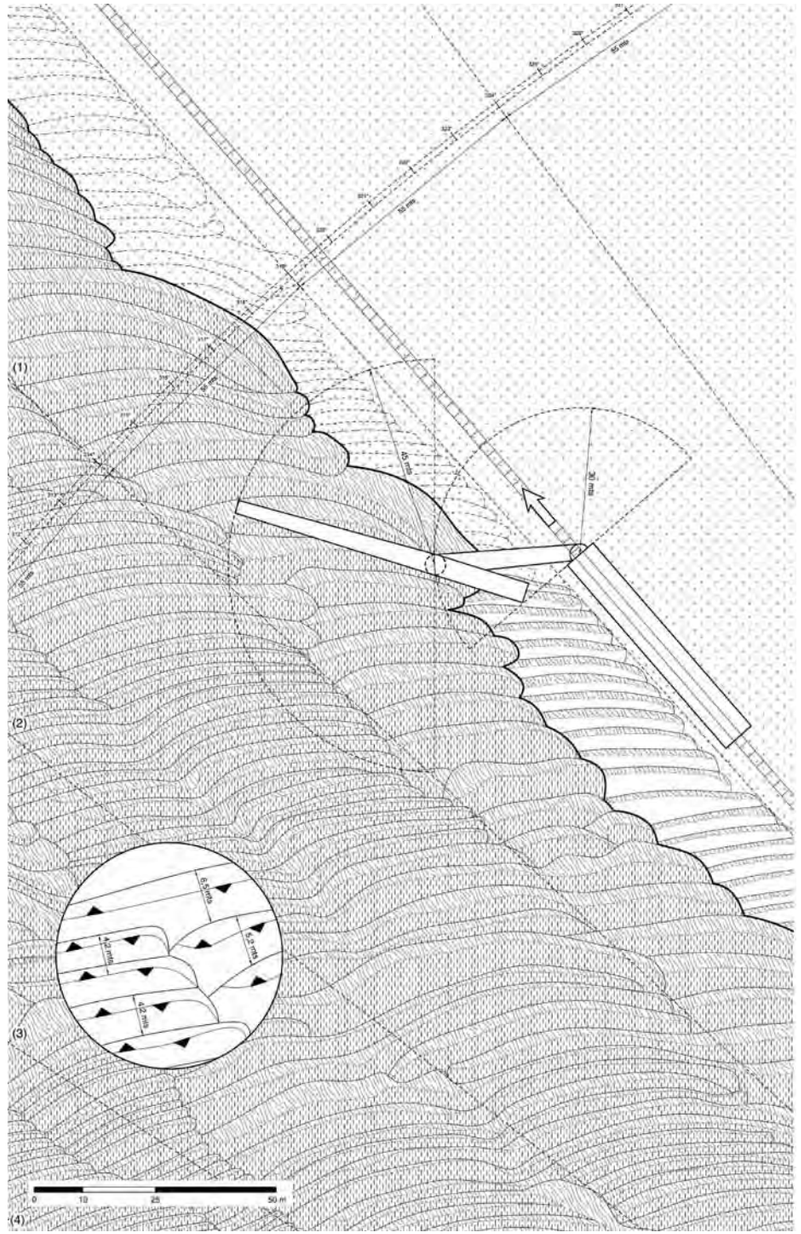
Commenting on the intersection of two crises in architecture: one of the profession (seemingly solved by invoking relevance and responsibility) and the other of the university system (wishfully tackled by contemporary calls for the interdisciplinary), Robert Somol refers to Arthur Drexler's proposition that 'the purpose of technology is to make the dream a fact' (as it was used, in turn, by Reyner Banham to open up *The Great Gizmo*). But in quoting both Drexler and Banham, what Somol seeks is to extend this observation with the inverse axiom: '*that the purpose of theory is to make the fact a dream*', which is to say "that a key function of theory is to demonstrate that what we take to be '*reality*' is much more plastic and open to transformation that historical or current agencies allow."[34] Thus, the rather theoretical proposition contained in our triptych would set itself into the task of transforming the hard-core economic facts of mining, tourism and astronomy, into the dream of an ecological/industrial context for the Atacama Desert. Confronted against what we use to call reality, this is of course likely to be a failure, but without risk, Somol concludes, there is simply no possibility for a cultural practice: '*failure has to be an option for architecture to act as an agent of cultural change*'. Especially if, with McHale, by culture we mean an ecological context: the whole system that encloses all human activity within the biosphere.

Thus the images in the triptych aim at framing the ground of the Atacama Desert in its vertical condition in search of transforming the trophic web- and not the plan or the aerial photograph -into the site for

22 Robert Smithson, *Entropy Made Visible: interview with Alison Sky*, in: Nancy Holt (ed.), "The Writings of Robert Smithson: Essays with Illustrators" (New York: New York University press, 1979), p. 196.
23 Charles Bunn, *Crystals: Their Role in Nature and Science*, p. 4.
24 Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge: Harvard University Press, 2004), p.8.
25 Bruno Latour, *Politics of Nature: How to Bring the Sciences* into Democracy, p.10.
26 Bruno Latour, *Politics of Nature: How to Bring the Sciences* into Democracy, p.21.
27 John Mchale, *The Future of the Future* (New York: George Braziller, 1968), p.232.
28 John McHale, *The Ecological Context* (New York: George Braziller, 1970), p.8.
29 In collaboration with UMWELT (Ignacio Garcia Partarrieu and Arturo Scheidegger).
30 Bernard Cache, *Earth Moves: The Furnishing of Territories* (Cambridge Mass.: The MIT Press, 1995), p. 22.
31 Pablo A. Marquet et al., *Ecosystems of the Atacama Desert and adjacent Andean area in northern Chile*. In: Revista Chilena de Historia Natural 71: 593-617, 1998.
32 Pedro Alonso, *Atacama Deserta*, in: Pedro Alonso (ed.), *"Deserta: Ecología e industria en el desierto de Atacama"* (Santiago: ARQ, 2012), pp. 14-37.
33 Fernando Flores and Terry Winograd. *Understanding Computers and Cognition: A New Foundation for Design* (Boston: Longmar Publishing, 1990), p.164.
34 Robert Somol, *Plastic Politics, or, Four and a third Earths are not Enough*. Visiting Scholar's Seminar at the CCA Study Center. Canadian Center for Architecture, 28th July 2011.



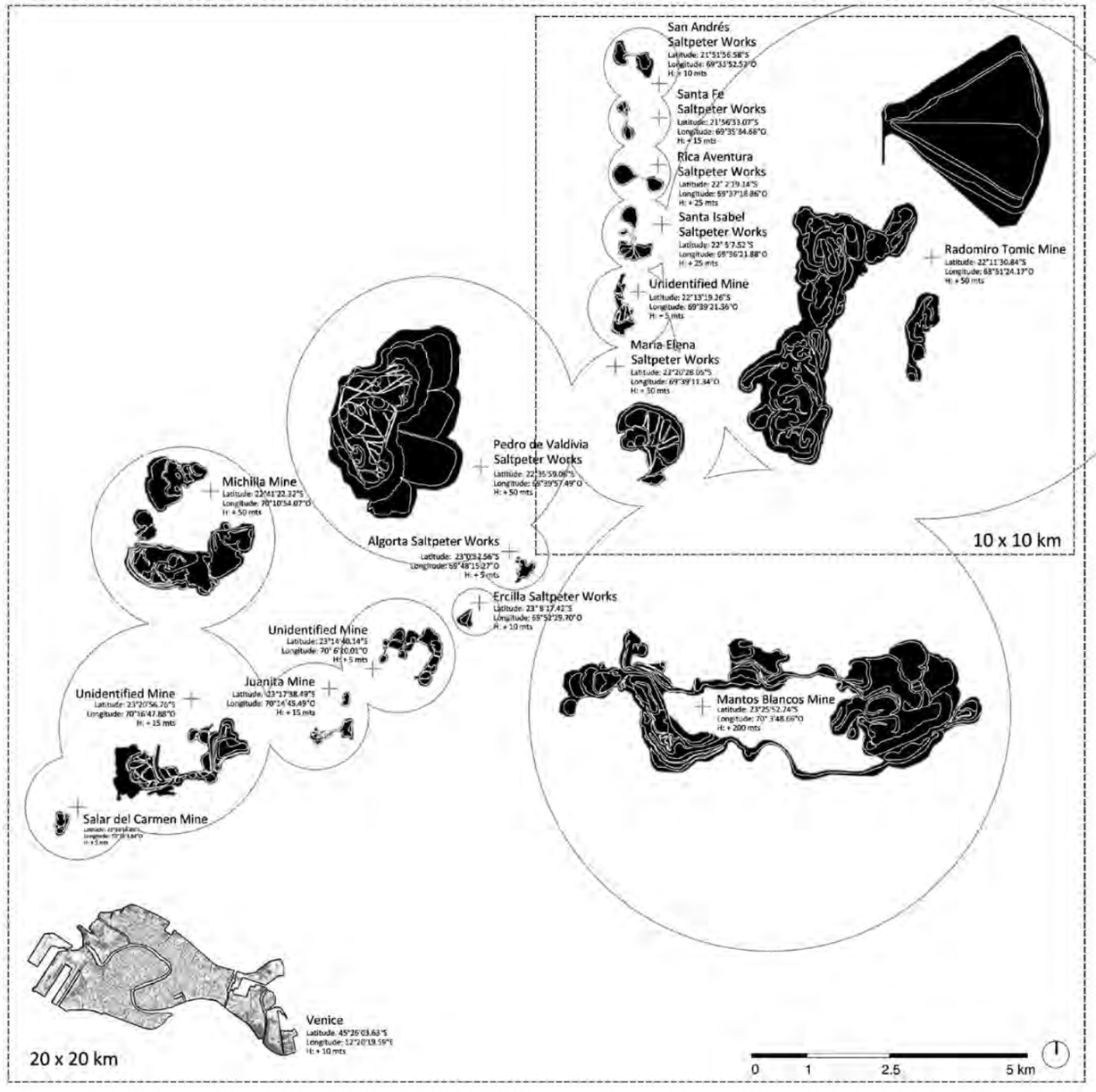
Ways to making up a mountain. Plan and diagram pattern
Trucks pilling up waste material by making the shortest possible loop from the mine to the heap in order to maximize efficiencies. Pedro Alonso in collaboration with UMWELT (Ignacio García Partarrieu + Arturo Scheidegger).

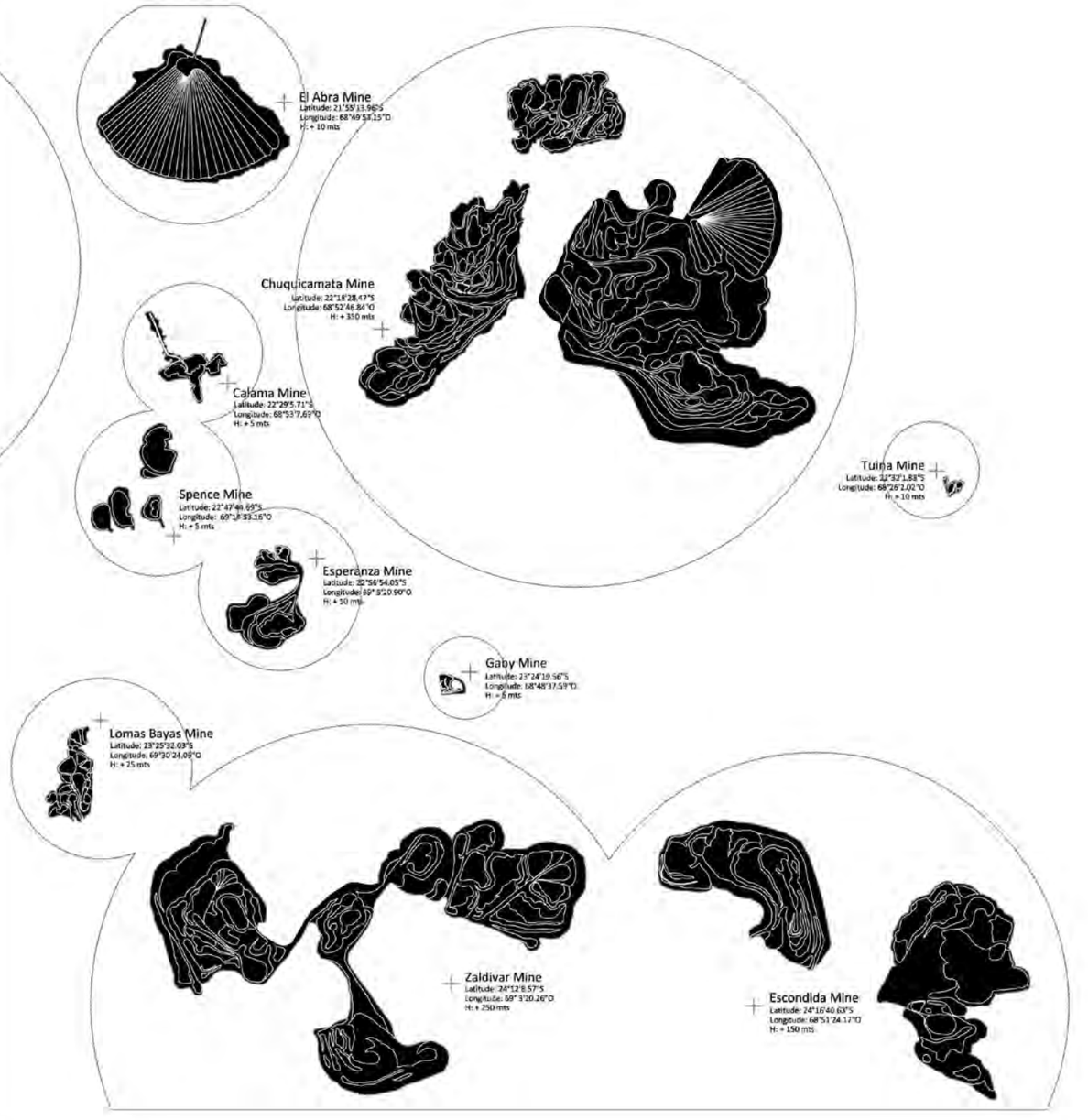


Ways to making up a mountain. Plan and diagram pattern
Mechanic open cast mine spreaders as the last element of the conveying line for dumping the overburden on the outside and inside dumps of the mines. Pedro Alonso in collaboration with UMWELT (Ignacio García Partarrieu + Arturo Scheidegger).

Atacama Desert Heap Leach and Waste Pile Mapping

Mapping of the Atacama Deserta man-made slag heaps. Includes relative positions, heigts, and scale comparison with Venice Island, Italy. A square of 20x20 kilometres has been drawn to indicate the land area required to produce the current energy usage in Chile, if implementing Concentrated Solar Power (CSP). Pedro Alonso in collaboration with UMWELT (Ignacio García Partarrieu + Arturo Scheidegger).



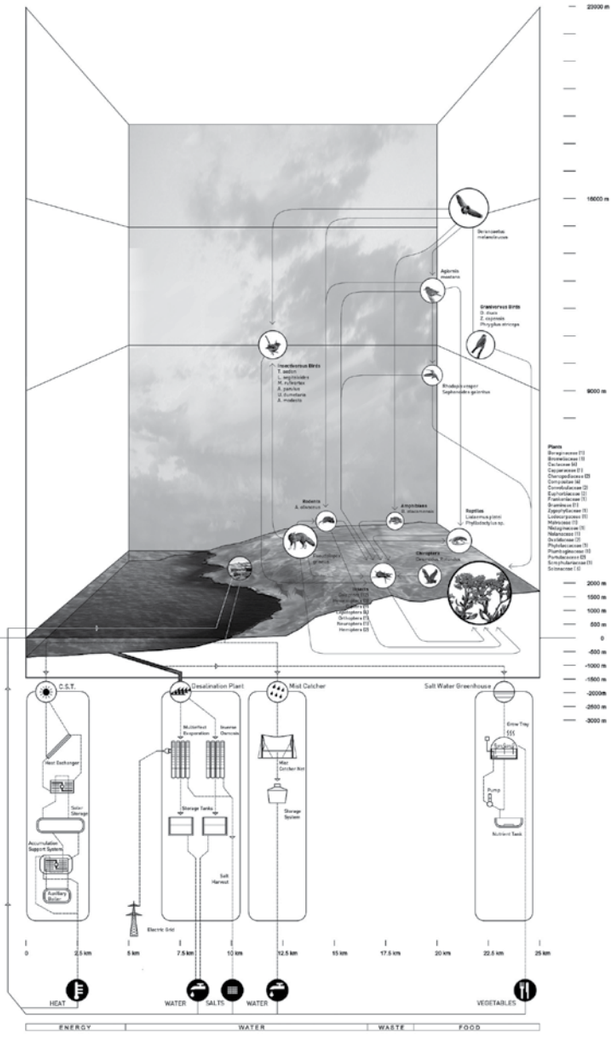


infrastructure and architecture. In other words, the site where to inset a project does not pre-exist our representation/understanding of it. Like Banham's own contrived image of architectural beginnings, these images shall resist classification by the geometrical disciplines by which most projects are dominated, and refer to something that "while not conforming to traditional canons of judgment, will require design to be immediately apprehensible visual entity".[35] For us these images are not the rendering of '*projects*' conceived by other means, but reversing the project's reputed priority upon representation, they are conceived as architectural arguments. As long as Atacama is pure energy: the place on earth with the highest rate of direct solar radiation and thus the larger anti-entropic reservoir in the world–such images emerge at the consideration of architecture from the integration of technologies within the demands on the floor posed by different economic activities: vectors pulling in different directions in the shaping of the ground's surface. Thus we have drawn frames where to insert the mass of tradition and association and the energy of novelty and technology. Ultimately, as Banham himself would say, the desert is the perfect place for fantasy: in a landscape where nothing officially exists (as the case of our industrial man-made mountains confirms), absolutely anything becomes thinkable, and may consequently happen.[36]

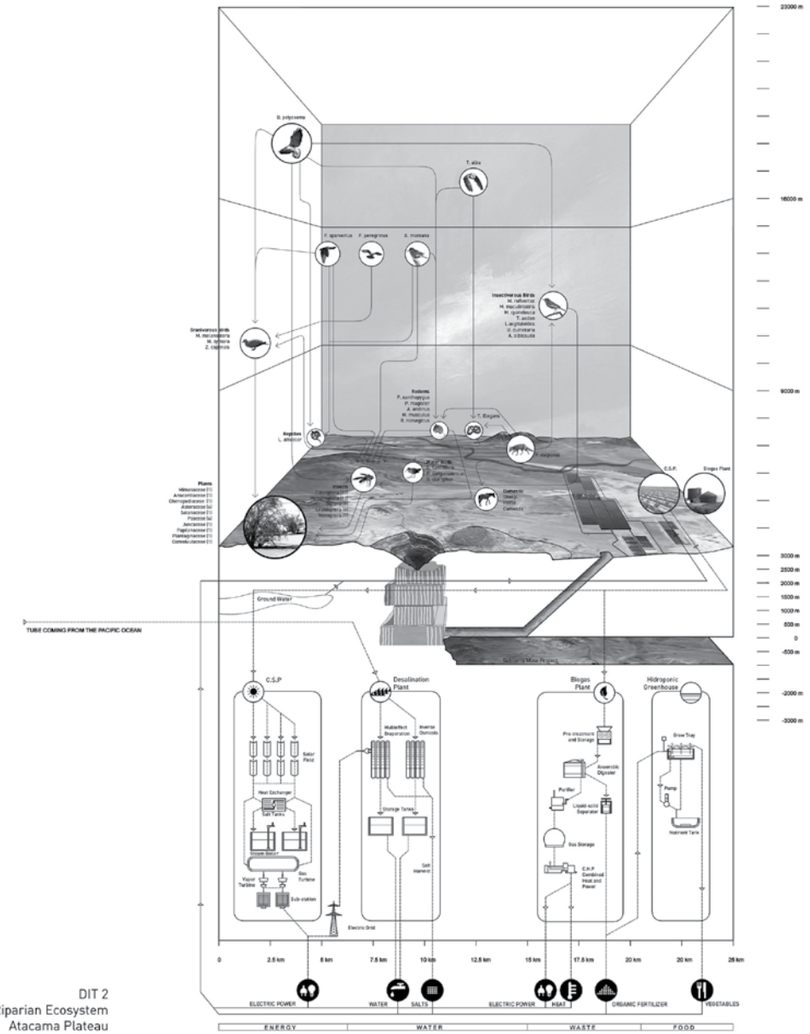
35 Anthony Vidler, *Histories of the Immediate Present: Inventing Architectural Modernism* (Cambridge Mass.: The MIT Press, 2008), pp. 134- 135.
36 Reyner Banham, *Scenes in America Deserta* (London: Thames & Hudson, 1982), p. 44.

TRIPTYCH

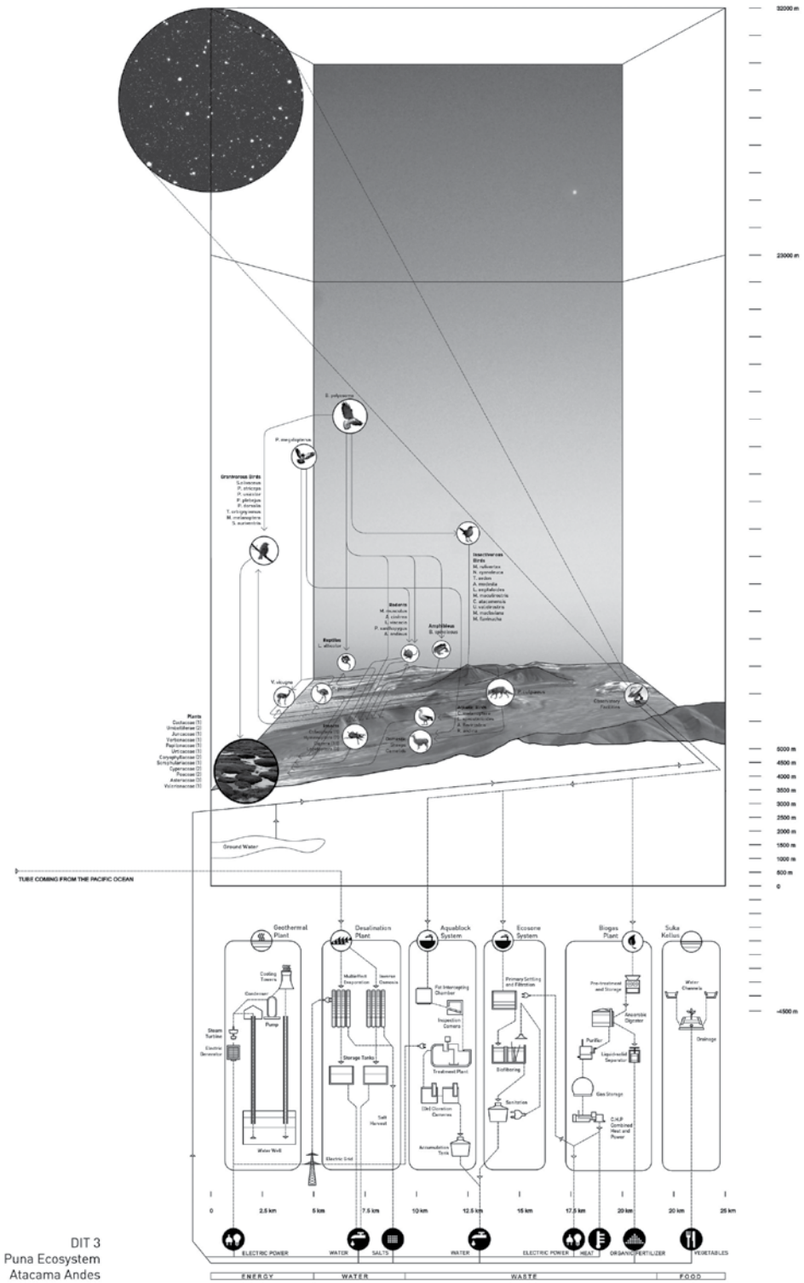
Pedro Alonso in collaboration with UMWELT (Ignacio García Partarrieu + Arturo Scheidegger). The design of a diagram of technological integration DIT incorporates all actors considered relevant in search of introducing 'cycles' within alternative technologies and industries. These technologies are taken from Flavio Sciaraffia's Catalogue as published in Pedro Alonso's *Deserta: ecology and industry in the Atacama Desert*. They are not 'new' in the sense of high-tech innovation, but in the manner in which they would integrate within new assemblies and combinations, replacing obsolete industrial infrastructures heavily based on fossil fuels. This diagram is developed out of four main categories: energy, water, waste, and transportation, becoming into a quest on renewable energy, water and waste management and recycling, and low- carbon transport systems. The combination of these technologies into a novel system is what we call a Technological Mix. DIT opens up the possibility of defining a new ecological context for programs unthinkable within the previous linear carbon-based conventional process, from the incorporation of DIT to the trophic web proper to each particular ecosystem. In order to balance blind devotion to cutting-edge technologies, 'dirty' procedures (to use Alex Wall's use of the term) should be equally considered disruptive to current practices, including, for example the ancient Tiwanaku's *suka kollus* technique, Charles Wilson's first solar desalination plant in Atacama (1874), Alto Patache's water mist catchers, and the Tohá water treatment method. New agents, disruptive, dirty and transparent (as characterized in the introduction to the book *Deserta*) create new assemblies and associations now deprived from nature as organizing category and would consequently emerge into a new set of relations and hierarchies becoming available to be thoroughly interlocked in a close symbiotic relation, a man- made ecology integrally functioning within the overall ecosystem.



DIT 1
(Integrated Technologies Diagram)
Paposo Ecosystem
Atacama Coast



DIT 2
Riparian Ecosystem
Atacama Plateau



DIT 3
Puna Ecosystem
Atacama Andes