Arctic Perspective Cahier No.1

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ARCHITECTURE

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HATJE CANTZ

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PART 1

Arctic Perspective Initiative

Inke Arns,
Matthew Biederman,
Marko Peljhan

The Arctic Perspective Initiative (API), a transnational art, science, and culture work group consisting of partner organizations from five different countries—HMKV (Germany), Projekt Atol (Slovenia), The Arts Catalyst (UK), Lorna (Iceland), and C-TASC (Canada)—was set up to direct attention to the global, cultural, and ecological significance of the polar regions. These are zones of contemporary geopolitical conflict and at the same time potential spaces for transnational and intercultural cooperation and collaboration. In light of the changing climate, the indiscriminate economic exploitation of untapped reservoirs of energy and natural resources in the polar regions is increasingly feasible and inevitable. Unfortunately, because of vested geopolitical and economic interests, much of this is happening without taking into account that there are determined native cultures inhabiting the whole of the circumpolar territories.

API emphasizes that the significance of the polar regions is not exclusively economic. Rather, the (natively inhabited) Arctic and the (uninhabited) Antarctic, as well as the radical cultural and ecological changes taking place at the North and South Poles, are central to a critical understanding of the complex planetary system that involves a dynamic relationship between culture, economy, geopolitics, and ecology.

One of API's goals is to create a mobile work and habitation system which can be used for nomadic dwelling and media-based work on the land, away from the established Arctic settlements. The prototype of this system will draw from the experience and knowledge gathered within the context of the Makrolab,[1] a mobile and autonomous research station dealing with the intersection of art, technology, and science, developed by the creative team of Projekt Atol, under the leadership of Marko Peljhan. The first field test of the prototype is scheduled for the winter of 2010 near Igloolik, Nunavut (Canada).

API's inclusive and open working strategy is designed to foster the sustainable empowerment of the local citizens of the North via new communications, sensing, aggregation, transmission, and information sharing. Through the development of open and free communication infrastructures, users can remain connected to one another and the world, building valuable networks both

1
Between 1997 and 2007 the Makrolab (http://makrolab.ljudmila.org) was deployed in various locations. See Brian Holmes, "Coded Utopia—Makrolab, or the art of transition" in Brian Holmes, *Escape the Overcode: Activist Art in the Control Society,* 2009, http://brianholmes.wordpress.com/2007/03/27/coded-utopia; Inke Arns, "Faktura and Interface: Hlebnikov, Tesla and the Heavenly Data Traffic in Marko Peljhan's makrolab (1997–2007)," in Kwastek, Katja, ed., *Ohne Schnur: Art and Wireless Communication* (Frankfurt am Main, 2005), pp. 62–79, http://www.inkearns.de/Texts/Arns-Faktura-Peljhan-2005-ENG.pdf

socially and scientifically. By enhancing mobility, the project promotes sustainable community growth of Canada's Arctic cultures and communities through education (both traditional and "southern"), science, and the arts. API's nomadic units will be powered with renewable energy sources and will leave virtually no adverse ecological footprint while enabling filmmaking, media production, editing, subsistence hunting, video and audio streaming, and environmental "citizen sensing" observation and assessment. The systems on board will provide an opportunity for local communities to direct their own environmental monitoring and assessment, as well as providing an infrastructure through which to share the results.

Past, Present, and Future Activities

In 2006 Marko Peljhan, Stephen Kovats and Sašo Podgoršek made their first trip to Igloolik, Nunavut, to lay the groundwork by meeting with elders and community members. Since then the international framework of API has been developed, involving media artists, filmmakers, local hunters, architects, designers, scientists, community planners from both the north and south. In 2007–2008, an international working group consisting of HMKV (Dortmund), Projekt Atol (Ljubljana), The Arts Catalyst (London), Lorna (Reykjavik), and C-TASC (Montreal) applied for funding at the European Commission in the framework of Culture 2007–2013 for the project *Arctic Perspective—Third Culture* which proved to be successful.

In 2009 API held an international open design competition for "a mobile media-centric unit" and received 103 entries from over thirty countries.[2] Three equal prizes were awarded to designs submitted by architects from Nunavut/Canada, France, and Italy. These will be taken to Iqaluit, Kinngait, Kanngiqtugaapik, Igloolik, and Mittimatalik, where the second collaborative design phase will be presented for review and updating before the construction of the first prototype begins.

During the course of the development of the project, four cahiers—conceived as working papers—will be published dealing with topics that are central for the project. *Arctic Perspective—Third Culture: Cahier No. 1*, edited by Andreas Müller (An Architektur, Berlin), focuses on Arctic architecture and documents the results of the international design competition. *Cahier No. 2,* edited by Nicola Triscott (The Arts Catalyst, London) and Michael Bravo

2
See the press release for the results: http://www.hmkv.de/dyn/_data/API_ARC_Press_ReleaseOcto09v7.pdf

(Scott Polar Research Institute, University of Cambridge), addresses circumpolar cultures and how geopolitics and ideologies affect these cultures. *Cahier No. 3,* edited by Adam Hyde (FLOSS Manuals), deals with the technology involved in building a mobile habitat for the Arctic. The *Cahier No. 4* will be the last one edited in this phase of the project and will be devoted to the reflection of the exhibition, activities and processes of the API in 2010.

***Arctic Perspective—Third Culture* will be presented as a large-scale exhibition at PHOENIX Halle Dortmund in the framework of the European Capital of Culture RUHR2010 as well as ISEA2010 RUHR—The 16th International Symposium on Electronic Art. One of the goals of *Arctic Perspective—Third Culture* is to "bring back" the long-term effects of industrialization to one of the places—the Ruhr Valley—from which the industrialization process started. There could be no better venue for such an endeavor as the giant spare parts depot of the former steelworks Phoenix-West in Dortmund, built in 1895. While the exhibition will document the steps that have been taken in order to build the mobile media-centric habitat, the conference, funded by the Bundeszentrale für politische Bildung (German Federal Agency for Civic Education), will create a larger picture, shedding light on circumpolar activisim, geopolitics, cryosphere developments, climate changes and their effect on the circumpolar cultures as well as on leading technological breakthroughs that will enable the development of the API nomadic habitation "system of systems."**

We would like to thank the peoples of the North, the European Commission, the City of Dortmund, the Bundeszentrale für politische Bildung, Arts Council England, the city of Ljubljana, and the Ministry of Culture of the Republic of Slovenia for their generous support.

Arctic Architecture

Andreas Müller

For a long time architectural discourse happened in "the South"—which is the rest of the planet as seen from the Arctic—and only occasionally entered the polar regions. If architects did deal with the North, it was in the form of rather one-directional projects that stressed the harsh conditions for survival or the spirit of exploration and occupation of unknown territories, with little dialogue occurring between the contexts. Today an increasing political interest in the Arctic is also reflected in various scales of spatial discourses, from the planetary scales of geopolitics and climate control to the domestic space of ecological building. Although contemporary discourses surrounding the Arctic often appear solely as environmental or climate research, the motifs behind building in the region are often bound up closely with territorial claims, geopolitical hegemony, or outright colonial interests.

The Arctic

According to international law the geographic North Pole or the region of the Arctic Ocean surrounding it is not under the control of any single country. The surrounding Arctic states that border the Arctic Ocean—Russia, Norway, the United States, Canada, and Denmark (via Greenland)—are limited to a 200-nautical-mile economic zone around their coasts. Upon ratification of the United Nations Convention on the Law of the Sea, a country has ten years to make claims to extend its 200-mile zone. As a result, Norway, Russia, Canada, and Denmark have launched projects to establish claims that certain Arctic sectors should belong to their territories. In the nineteen-nineties the Arctic Council was formally established to provide a means for promoting coordination and interaction among the Arctic states, with the involvement of the Arctic indigenous communities on common Arctic issues, in particular issues of sustainable development and environmental protection in the Arctic.

The Arctic region can be defined as the area north of the Arctic Circle, which is the approximate limit of the midnight sun and the polar night. Alternatively, it can be defined as the region where the average temperature for the warmest month, July, is below ten degrees Celsius. Socially and politically the Arctic region includes the northern territories of the eight Arctic states (including Iceland, Sweden, and Finland), although by natural science definitions much of this territory is considered subarctic. The Arctic region consists of a vast, ice-covered ocean surrounded by treeless, perma-frozen land. Due to global warming the planet's isotherms move polewards, and consequently the Arctic region as defined by temperature is currently shrinking. Perhaps the most spectacular

result of Arctic shrinkage is sea-ice loss. There is a large variance in predictions of Arctic sea-ice loss, with some projections showing near-complete to complete loss for the month of September as from 2040. This could have massive ramifications on global transport, as it would open up entirely new shipping routes.

Arctic Perspective Initiative

The Arctic Perspective Initiative approaches the Arctic as a cultural territory. API considers its Arctic research as a collective practice, which will be developed together with local stakeholders and closely linked to the Arctic communities. It will create the framework conditions for collaborative projects between aboriginal cultures, artists, hunters, scientists, tactical media workers, and engineers in the Arctic within three broad topical fields: migration, climate, and telecommunications. In order to address these issues, API's activities include the development, installation, and deployment of mobile, zero-impact modular research units. These units are envisioned as life-support modules that will allow its residents to create, live, and work together on the land, physically separated from the settlements yet connected through communication technologies and sensor networks. The first phase of the project was an open design competition held in summer 2009 which received 103 submissions from thirty different countries. The first part of this book is a documentation of the competition, the three awarded projects, and several striking ideas developed in other submissions. The second part is a series of essays commissioned for this publication, in order to reflect on the manifold questions surrounding the Arctic and its architecture.

The question of mobility and the possibility of relocating the research unit was central to the competition brief. As Robert Kronenburg pointed out in his analysis of the submitted projects, this question can be approached via three key issues—transportation, assembly, and environmental impact. Within the projects submitted for the competition various modes of transportation were proposed, ranging from traditional sled constructions towed by dogs to helicopter transport; from randomly sailing in the direction of the wind to the slow relocation of industrial infrastructures while extracting resources. The way in which a portable building is assembled has to be considered in relation to its mode of transport, and here two main strategies appeared in the proposals. Fully demountable buildings have the advantage of being transportable in parts as well as being installed in alternative forms and sizes. However, a preinstalled, completed module would keep on-site

building works in the difficult weather conditions of the Arctic to a minimum. The environmental impact of the research unit—a key focus of the competition brief itself—is related to both its material construction and its performance in use. While most proposals suggested the application of high-tech construction materials and methods, there are also the low-tech solutions of traditional Arctic architecture to be considered.

Marilyn Walker's essay responds to the common imagination that the Arctic is an empty territory. Far from this, the northern polar region is inhabited by about one million people of many ethnic origins, nationalities, languages, and cultures. Obviously there is an enormous traditional knowledge of building in the Arctic, which has evolved over time to produce many refined architectural solutions, of which the snow house is the most commonly known. Walker shows how spatial configurations of Arctic indigenous settlements and buildings are deeply interwoven with spiritual conceptions.

Richard Buckminster Fuller developed concepts of mobile buildings as early as in the nineteen-thirties. He conceived them as standardized, mass producible structures that were supposed to solve the global housing problems of the time. As Carsten Krohn shows in his essay, Fuller developed and built many prototypes of homes and building modules, from a prefabricated bathroom unit to the dome-shaped U.S. pavilion for the 1967 World Expo. The concept of the geodesic dome, which is comprised of only two types of modular elements, was used widely for buildings that had to be transported to remote locations. The U.S. Navy used these shelters for radar stations around the globe and for many years the U.S. Antarctic station was protected under a geodesic dome.

One of the few modernist architects who dealt with the design of inhabitable environments and entire "Arctic Cities" was the British architect Ralph Erskine. Many European architects of the postwar period turned to the colonies of the European empires to experiment in a supposed "tabula rasa" situation. Erskine had a similar approach, but rather focused on the northern part of his country of residence, Sweden. His well-known project for an "Arctic City" carefully takes into account the climate conditions of its location as well as the social organization of its inhabitants. However, as Jérémie McGowan points out, there is a dark side to Erskine's Arctic projects that is no less blind to the political context than the projects staged in the European colonies. Erskine's projects in the Arctic were state commissions, either by the Swedish or by the Canadian government, closely entangled with forced resettlement campaigns of indigenous people.

The third part of the book contains two reports of expeditions to the Arctic. Stijn Verhoeff contributed a long quote from an expedition report by the British explorer Captain John Ross. It appeared in 1819 under the impressive title *"A voyage of discovery, made under the orders of the Admiralty, in His Majesty's ships Isabella and Alexander, for the purpose of exploring Baffin's Bay, and inquiring into the probability of a north-west passage."* The quote consists of lists taken from the introduction of the report: equipment on board the ships, supplies for the journey, payments of the sailors, the duties of each shift, etc. Their pragmatic format—far from narrative—nevertheless depicts in a very detailed way the conditions of Arctic research at the time as well as the imaginations, hopes, and misunderstandings associated with it.

A report by API members Matthew Biederman and Marko Peljhan describes an Arctic expedition of 2009. Biederman and Peljhan joined a trip of several Inuit families from Igloolik, Nunavut, to Ikpik Bay in order to visit places of their ancestors and traditional camp sites. For API this exercise allowed the opportunity to develop the research unit and its systems with direct input from community members as well as to gain a greater understanding of the social context in which it will be operating.

Arctic Perspective Design Competition Documentation

Competition Finalists:

Catherine Rannou, Richard Carbonnier, Giuseppe Mecca

HMKV (Dortmund,Germany), Projekt Atol (Ljubljana,Slovenia),
The Arts Catalyst (London,UK), LORNA (Reykjavik, Iceland) and
CTASC (Montreal,Canada)

Announce the following call for proposals:

OPEN ARCHITECTURE DESIGN COMPETITION

ARCTIC PERSPECTIVE INITIATIVE

"MOBILE MEDIA-CENTRIC HABITATION AND WORK UNIT"

The ARCTIC PERSPECTIVE INITIATIVE "MOBILE MEDIA-CENTRIC HABITATION AND WORK UNIT" open architecture design competition is open to the submission of proposals for the design of a mobile, media-centric facility, life support habitation and work module with a renewable energy supply, waste recycling, and communications systems. We invite proposals from architects, designers, engineers, artists, students, and engineering teams.

The design should be an open source mobile architecture/system/machine capable of functioning in extreme as well as temperate climates and containing mass/industrial and amateur production/manufacturing potential. The unit is to serve as a model for mobile research in extreme cold environments, designed to incorporate high tech solutions while utilizing sustainable resources.

Submitted entries are intended for the competition only. The selection of prizewinners does not guarantee the intent of API to award a commission for the actual building of the project, however API does reserve the right to consult and negotiate on the continuation of the development with selected entrants pending the confirmation of the development budgets in 2009 and 2010. If realization is to continue, the first prototype will be tested in the field in the March/April/May 2010 time frame.

First Prize: 5000 EUR
Second Prize: 2500 EUR
Third Prize: 1500 EUR

Jury decisions to be published by October 1, 2009.

All winners and honorable mentions will be published in the API Cahier #2 "Architecture", which will be edited in the Fall/Winter 2009. All winners and honorable mentions will be included in exhibitions and presentations in the framework of European Capital of Culture RUHR.2010 as well as the international media-art conference ISEA 2010 RUHR, with additional exhibitions and presentations to be confirmed.

All submissions selected for exhibition and publishing will be notified in advance.

The ARCTIC PERSPECTIVE – THIRD CULTURE project is supported by the European Commission Culture 2007-2013 grant and by the Ministry of Culture, Republic of Slovenia. Other funding is pending.

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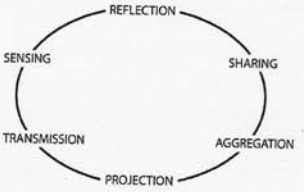
Criteria

All submitted entries should clearly demonstrate the ideas, themes, and designs for each of the following criteria in response to the programs below:



Program and Characteristics

The ARCTIC PERSPECTIVE INITIATIVE "MOBILE MEDIA CENTRIC HABITATION AND WORK SYSTEM" shall **at minimum** accommodate the following program:

1200-1500 kg maximum mass
500km minimum radius of operation
5kW min power generation
life support for 3 people for up to 15 days
towable/drivable
Operation between 10 °C and -40 °C

galley
toilet/shower
first aid facility
communications facilities
workspaces/rest spaces
Stable operation with winds up to 85km / hr

ADDITIONAL DESIGN CONSIDERATIONS:

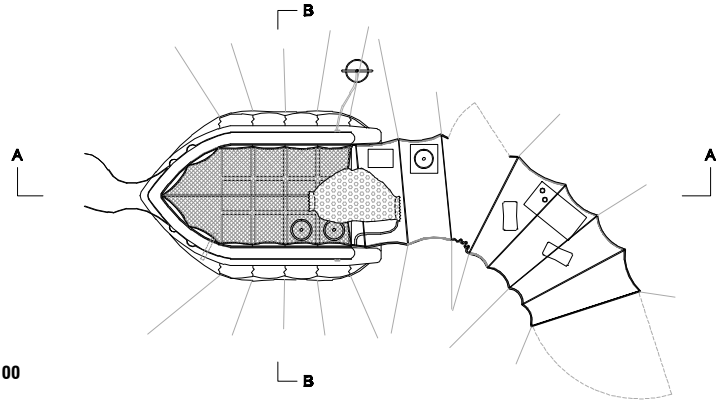
rest bunks
buoyancy
natural light source use
provision for modularity of systems on site
snow smelter
sauna
grey and black water recycling
ability to support 19-inch frame technologies

Anonymity

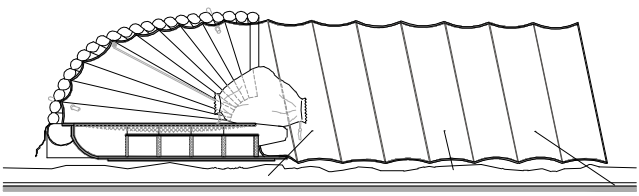
Jurors will not be informed of any entrant's identity. Final submitted material should include no name or other information that could lead to identification of the entrant. Competition coordinators will review the applications and assign a random code to each entrant, which the jurors will use to identify the submitted entry.

The design proposed by Catherine Rannou is inspired by the concept of the dogsled. It consists of a low sleigh shell of polyethylene and an extremely light pneumatic skin of ETFE, which can be inflated manually to form a tunnel-like space. This core unit is 1.90 x 3.20 meters large, weighs only eighty kilos, and provides the basic living facilities for one person. It can be extended by an additional tent tunnel to cover scientific equipment, to provide a protected workspace, or to host the sled dogs. Each unit provides space for one person only.

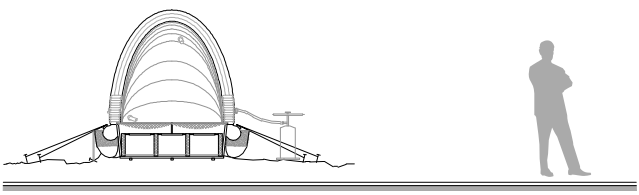
For reasons of autonomy and security the vessel has to be deployed in groups of two or more, which can be connected to each other via the extension tunnels. A small ceramic heating system is provided for emergency cases only. The design relies entirely on the insulation of the inflatable skin and the conservation of the heat from its inhabitants. Energy supply equipment like solar panels and wind turbines is detached from the vessel and can be installed at a distance. The use of dogs to transport the vessel is a deliberate choice in order to perpetuate traditional Inuit knowledge.



PLAN 1:100



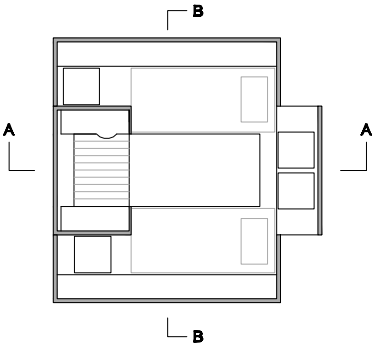
SECTION A - A



SECTION B - B

Richard Carbonnier's proposal is inspired by the Inuit way of life, the Qamutik sled and the typical plywood shelter widely used on sleds in the Canadian Arctic. The traditional shelter is replaced by a shell habitat made out of sandwich composites. The bottom external shell is an aluminum hull designed for impacts and sea ice crossings. All parts are buoyant and will maintain the habitat afloat in an emergency situation. The shell is 1.40 meters high, 1.70 meters wide, and three meters long and is adapted to all means of transport. Weighing 300 kilos fully configured, it may be hauled by snowmobile or small all-terrain vehicle. Designed for two people, the top shell flips open into a soft shell tent cover providing 10.5 square meters livable space.

The habitat offers sleeping/work space, bathroom/shower/kitchen, and may be reconfigured for specific use or combined with other units. Life-support systems, energy requirements, and waste management are optimized, space usage rationalized, and weight minimized. The unit provides full autonomy with a minimal logistical support. The habitat is extremely well researched; shell and systems consist of interchangeable components suited for the Arctic, Inuit know-how, and the requirements of the scientific community.



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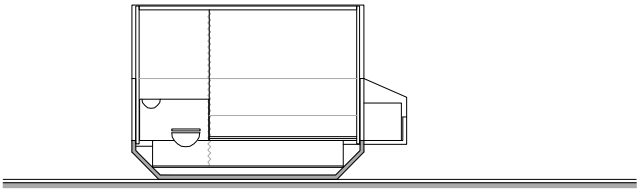
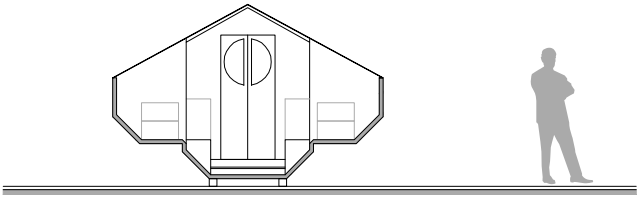
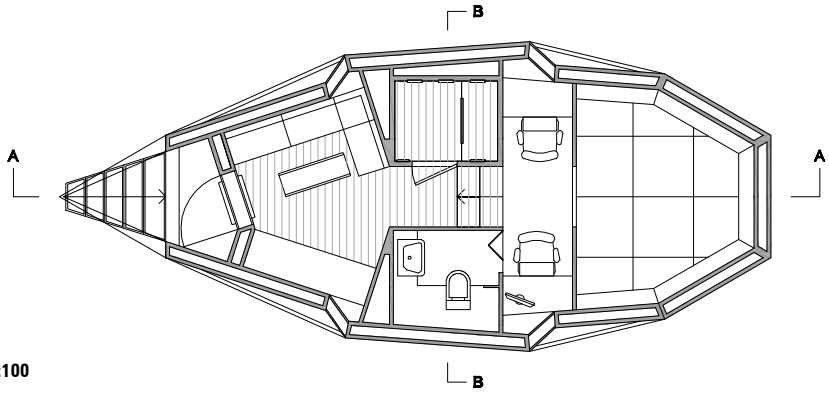


SECTION A - A



SECTION B - B

Giuseppe Mecca's proposal refers to circumpolar indigenous building types that consist of a wooden frame covered by a leather skin. However, it transfers these traditional concepts to contemporary high-tech construction technologies like an aluminum spaceframe, extremely efficient insulation materials, and protective membranes. In contrast to the other two proposals this building is constructed as a stiff structure that does not change between transport and stationary state. Therefore, it is distinctly larger than the other two proposals (4.10 x 9.40 meters), offering instead more comfort, including an interior separated into different rooms, a sleeping room for two people, a sauna, a covered entrance area, etc. Considering the increased weight of such a large vessel, the possibility of transport on skates seems unlikely, requiring the development of a specific transportation strategy.



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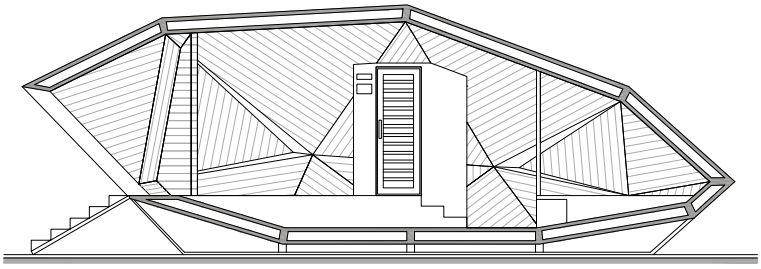
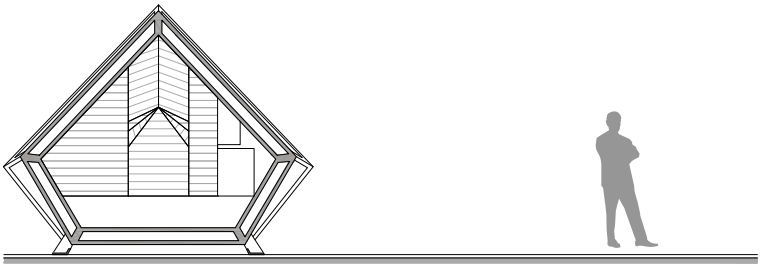


SECTION A - A



SECTION B - B

Mobile Architecture in the Arctic

Robert Kronenburg

The most straightforward description of mobile architecture is that it is a building that moves. Despite the apparent contradiction that the most permanent and heaviest of human artifacts can be relocated from place to place, there exist a wide range of typologies, a large variety of technological approaches, and a surprising diversity of functions within this architectural genre. The use of the term *mobile* in this context most commonly brings to mind intact building-shaped objects being transported whole, so a more common term is *portable architecture,* which denotes buildings that have a wide range of strategic approaches to mobility. These might also be transported whole and intact, but are more usually in a small number of large components for easy relocation and speedy assembly, or in a more modular approach, as a large number of components that take longer to assemble but allow more flexible buildings of different form and size. Portable architecture is a form of building that can, and is, utilized for virtually every architectural function there is, from homes and offices, schools and hospitals to concert halls and sports stadia. This is because portability is a design factor that in certain circumstances, depending on economic, planning, or environmental grounds, is potentially desirable for every type of building function.[1]

There are, however, some situations where portability is not only desirable, but also essential—conditions in which the building function simply cannot be achieved in any way other than with a portable solution. Portable architecture is therefore, in some cases, not only the last resort but also the one that has to work. For this reason it must also be frequently innovative in concept and execution and be created at the extremity of current design capabilities. It is a form of architectural design that has creative parameters that extend beyond the normal boundaries of conventional building form and function, and often must utilize resources, techniques, and technologies from other fields in order to succeed.

The factors that drive the necessity for a portable solution (rather than mere desirability) are sometimes related to function—for example, a repetitive event or task that needs to be carried out in different locations at short intervals. An example of this is the mobile field hospital, where speed is of the essence in treating patients adjacent to the site of an emergency—the building must

1
For detailed studies of the design of portable architecture see Robert Kronenburg, *Portable Architecture: Design and Technology* (Basel, 2008) and Robert Kronenburg, *Houses in Motion: The History, Development and Potential of the Portable Building* (Chichester, 2002).

be in use as quickly as possible, in a location as close to the field of operations as can be attained. However, the necessity for portability is most often related to the environment in which the facility has to operate—local conditions making it impossible or impractical to undertake a conventional construction project, even if materials can be brought in. There are many such locations around the world where such conditions exist but where there is still also a necessity for a human presence and activity. Whether it is a mining operation in the Northwest Territories of Canada, humanitarian aid in the Darfur region of Sudan, environmental surveys in Sakha in Siberia—the lack of materials, the harshness of local weather conditions, and the limitations of labor, energy, and other resources make portable building solutions essential to the success of such operations.

David Garcia Studio / D. Garcia & A. Baudinet (Copenhagen, DK): Mobile Media-Centric Habitation and Work Unit

Portable architecture, despite not being designed for specific locations is still designed for a specific site. The various parameters of function—weather, users' needs—are still essential considerations in the creation of successful buildings. Even more careful attention to the brief, construction parameters, and building operations are needed to ensure the building is deployed successfully and then stays in use—often in locations very remote from normal building suppliers and contractors. However, portable building construction has the advantage of being undertaken in factory-controlled conditions where standards of craftsmanship can be at their highest and the various elements of the building can be tested before being put into use.

Bread Studio (London, UK / Hong Kong, China): Revolver

One of the key differences between portable architecture and static architecture is the necessity for special consideration to be given to transportation and installation at its first site and then, of course, redeployment when the building needs to move to another location. This means particular attention to the weight of components (and the total weight of the facility), moving parts, assembly techniques, and flexibility and durability of materials.

Essentially, the entire building structure must be kinetic, although some aspects of the design may need to have the static form of its nonportable counterpart. An important factor in the decision-making process is therefore the mode of transportation—will the building be rolled, floated, or flown to its site? Such decisions are made on economic grounds, accessibility of transportation methods, and the urgency for the facility to be in use.

Despite the uniqueness of the design problems associated with portable architecture it is, however, "real" architecture and not just building. This is because the people who use it need to engage with it in the same way as conventional architecture, and the quality of space, environment, appearance, and image are as important in this situation as in any other architectural challenge. Engineering solutions can provide life support and shelter, but architecture describes buildings that respond to the need for comfort, community, and intellectual engagement that are essential components in human happiness and productivity. Although building performance issues are frequently much more difficult with portable architecture, it does not mean that its beauty and fitness for purpose need to be or should be reduced.

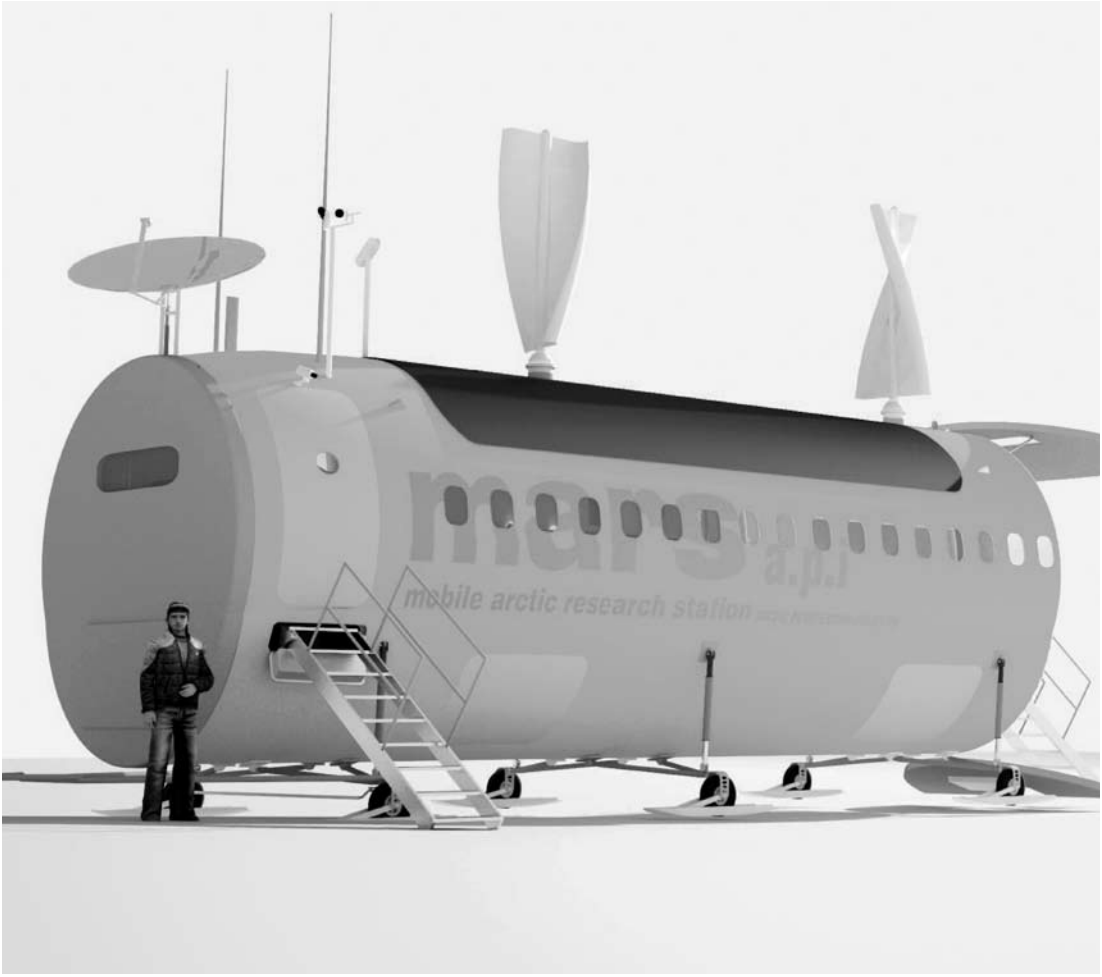
Polar Architecture

Of all the environments on Earth perhaps the most dynamically extreme is that experienced in the Arctic and Antarctic. The polar landscape experiences the lowest temperatures, the driest air, and some of the highest winds on the planet. To this can be added shifting ground planes due to snow buildup and the migrating ice shelf, an unreliable supply chain due to transportation difficulties, and the extreme isolation for inhabitants of being cut off thousands of kilometers from the rest of humanity for whole seasons. And yet people need to live and work there and so building solutions have been found, ranging from the primitive prefabricated wooden buildings of the early exploration expeditions, to the latest sophisticated portable solutions for national research stations.

The most recent of these is the British Antarctic Survey's Halley VI station, which has been under design and construction

since 2004 and is now planned for completion in 2011 (originally 2009). The Halley station was established on the Brunt Ice Shelf of the Antarctic in 1956 and the latest incarnation is a replacement for the previous five facilities, which have all succumbed to the extremes of the local environment. The station is situated not on ground but on the 150-meter-thick ice shelf, which gradually moves westward toward a break-off point where it disintegrates into icebergs. The outside average temperature in the depth of winter, during which the sun does not rise for three months, is -30°C, though it can drop as low as -56°C. Each year the surface of the shelf rises by 1.2 meters, so in addition to moving northward, the building's site gets higher. This means that even if the station could be built by conventional means, it would still need to be portable in order to be relocated at a new, higher and more "inland" site at regular intervals (though staying in much the same geospatial location) in order to avoid being buried by snow and ice and falling off the edge of the continent! Although the issues of building in the Antarctic are not identical to those of the Arctic, this particular solution, which features integral mobility as a key element in its viability, makes the Halley VI station a valuable precedent.

The solution to this extreme problem was reached via a design competition in which Faber Maunsell engineers working with Hugh Broughton Architects proposed the winning project. Key design factors were comfort and security for the residents (fifty-two in summer, sixteen in winter), flexibility and diversity of operations in a limited space, and certainty of building completion and continued operation in an environment where failure could be disastrous. The research station consists of a series of modules that each contain different functions, can be constructed, transported, and relocated independently, and enable the facility to be extended with the addition of further modules at a later date. Each module sits on ski-based legs that enable towing by caterpillar vehicles, but that also have hydraulic lifting systems enabling the module to be lifted up onto a higher level by bulldozing snow under one lifted leg at a time. The shape of the modules is also specially designed to restrict the amount of snow buildup in blizzards. The module structure is a prefabricated steel frame that is shipped to Antarctica in one piece, off-loaded onto the ice, and towed to its location. Glass-reinforced plastic (GRP) cladding panels with closed cell insulation foam are fixed with floors and basic internal fittings on site. Because of the shortness of the austral summer the fitting-out must take place in the following season. Special extremely efficient prefabricated service packs have been manufactured to enable the facility to operate with minimum energy use.



Laura Karnath and Carl Burdick (Los Angeles, USA): MARS Mobile Arctic Research Station

These were modeled extensively in three-dimensional CAAD drawings to make sure they fit in place perfectly prior to construction. This is not just to ensure ease of assembly in a difficult construction environment but also to maximize efficient use of space and optimize serviceability. Components are highly standardized to limit the number of stock spare parts carried, as it is impossible to access a replacement in such a remote location.

Halley VI is a complex, long-term solution for polar building; however, not all building functions are so well determined or so well resourced. Building demand that is short term or arises quickly requires speedy, economic solutions, and just as in mainstream architectural requirements, situations like this also arise for portable architecture in extreme environments. This demand is usually met by specialist contractors, who have developed practical expertise in logistics, materials, and construction strategies, enabling them to react quickly to clients' demands. Such expertise is of real value to designers creating bespoke solutions.

Weatherhaven is a company that specializes in providing portable buildings at short notice in remote locations and/or extreme environments. From their headquarters in Burnaby, Canada, they are able to provide a building facility to anywhere in the world, to support any function in almost any weather conditions. Based on their extensive field experience, their approach has been to devise a small range of core building systems that have modular components that can be adapted to any situation. The most flexible structural system they utilize is based on a lightweight frame of tubular segments that are assembled to form semicircular arches 4.88 meters wide (aluminum) or 9.15 meters wide (steel). This basic shelter form can be completed with in situ or prefabricated floors, weatherproof membranes, windows, and doors. The building can be assembled on skid-pads to enable relocation after assembly. "Polytherm" mass insulation is used in cold climates and extra bracing packs are available for high-wind situations. Add-on packs for all servicing such as heating, cooling, air filtration, power supply, water supply, and containment, cooking, laboratory, information technology, and engineering are designed to fit into the standard spaces. These buildings are very easily transported in universal packaging that is sized for various transportation systems, from ISO shipping containers to lightweight helicopter bays, from palette off-loading to manhandling. An un-insulated 32-square-meter building can be packed into one cubic meter of transportation space and the system is designed to be so simple to assemble that it can be erected by an unexperienced team after watching a streamed video from the Weatherhaven website.

Weatherhaven also manufacture more complex portable buildings that can be in use instantly and are suitable for the Arctic environment. The Mobile Expandable Container Camp (MECC) is a high performance facility contained within the confines of a standard ISO shipping container. It is shipped in its standard rectangular form as a 3,175-kilogram unit, and when it has arrived on site it can be moved by forklift or on a trailer. When sited the two sides fold down to create a space three times the size of the container floor (44.64 square meters) which can be prefitted out with high performance facilities such as a medical operating theater, science laboratory, or communications control center. The Mobile Work Camp (MWC) is Weatherhaven's most portable, instantly available building design for extreme cold environments where frequent relocation or instant in-use operation is necessary. The structure consists of a lightweight, arched steel frame fixed on a ski base. A vinyl covering contains a sleep/eat/work shelter fit-out unit that is light enough to be transported by helicopter or towed by a motorized snow bike. It makes a mobile, secure place of protection for expedition members who can therefore devote more of their time to expedition tasks rather than assembling and dismantling their shelter. Despite their proven operational success, designed as they are to provide a standardized response to the physical demands of these extreme environments, Weatherhaven products are not intended to meet the bespoke requirements that a specially developed solution seeks to address. Issues such as long term habitation, operational performance finely tuned to client needs, individual response to interior and exterior appearance, image, and identity are issues that require specialized dedicated design work but also provide the impetus to create innovative approaches to this challenging problem.

Arctic Perspective Initiative Competition

Because of the necessity to extend the boundaries of architectural expertise in order to achieve improved solutions to problems of increasing difficulty, there are advantages in initiating new projects in the polar regions via an open design competition. For this reason the Arctic Perspective Initiative's (API) strategy to seek ideas for its proposed Mobile Media-Centric Habitation Unit via this route was not unusual. The level of interest and the diversity and high quality of entries was indicative of the interest in portable architecture, but also the desire to design for extreme environments, something that is inextricably linked with the imperative to engage with innovative solutions that address environmental issues.

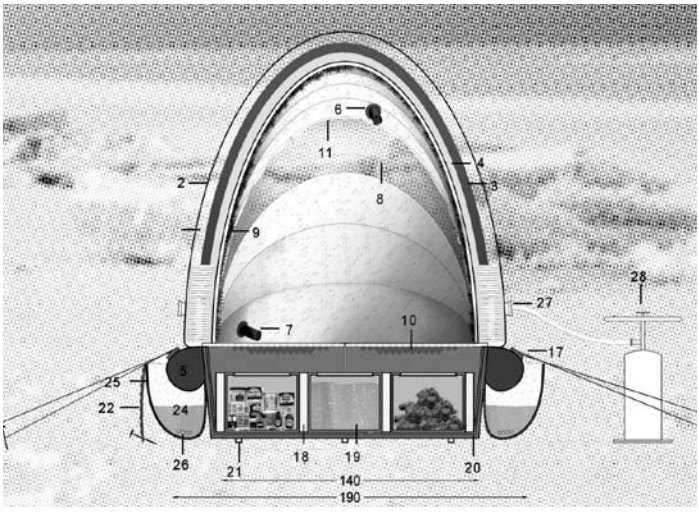
The design brief was to create a portable building that would function as both a work and living space and be capable of operation in the extremely cold climate of the far north, although it might be deployed anywhere in the Northern Hemisphere. The habitat function was to form a mobile media base for recording and communicating research, information, and news related to the Arctic environment, nature, cultures, and education. It was suggested that the building should be, as far as possible, autonomous, incorporating the use of renewable energy, water, and waste recycling systems. One hundred three entries were received from thirty countries, with a wide range of proposed solutions, ranging from the smallest minimal shelters to large buildings capable of supporting teams of workers.

As has already been described, there are a number of key issues that are paramount in designing buildings for remote, cold climate locations, and the success of the competition entries depended on their creators' knowledgeable engagement with these—not only in trying to solve the inherent problems but in doing so with ingenuity and a holistic awareness of the interlinked impact of their decisions. Although there are many differences between the various regions of the Arctic, for portable architecture to be sufficiently adaptable to cope with relocation it must successfully address three key deployment issues—transportation, assembly, and environmental impact.

Transportation: the successful project needs to be taken to, and then situated at, its destination and be capable of easy relocation in the future. Transportation must therefore be feasible with identifiable resources, financially viable, and achievable with the minimum of effort. The adoption of existing methods of transportation in the Arctic is therefore a key factor in this area. Off-loading and reloading should be as easy as possible, and consequently issues of weight, volume, protection from handling damage, and packaging into containers that are both compact and easy to handle are issues to be considered in assessing the proposed design's success in this area.

Assembly: once in place on site, it is almost inevitable that some form of in situ assembly work must take place if the first task of transportation is to be accomplished efficiently. There are, however, many options in the quantity of work that might be done in this area, from full construction from a kit of parts, to a completed module that can be in use almost instantly. The "kit of parts" has the potential advantage of compact transportation and may, if a modular system is used, also have the capacity to be constructed in alternative forms and sizes dependant on need and situation.

The "completed module" approach enables the facility to be in use straight away, meaning personnel can carry on with the task they are in the Arctic to pursue instead of construction work. It also avoids doing complex outside work in extreme conditions, where construction quality is difficult to control. Materials choice, component selection, detailed design, and interior planning are key issues in determining the success of the proposals in this area.

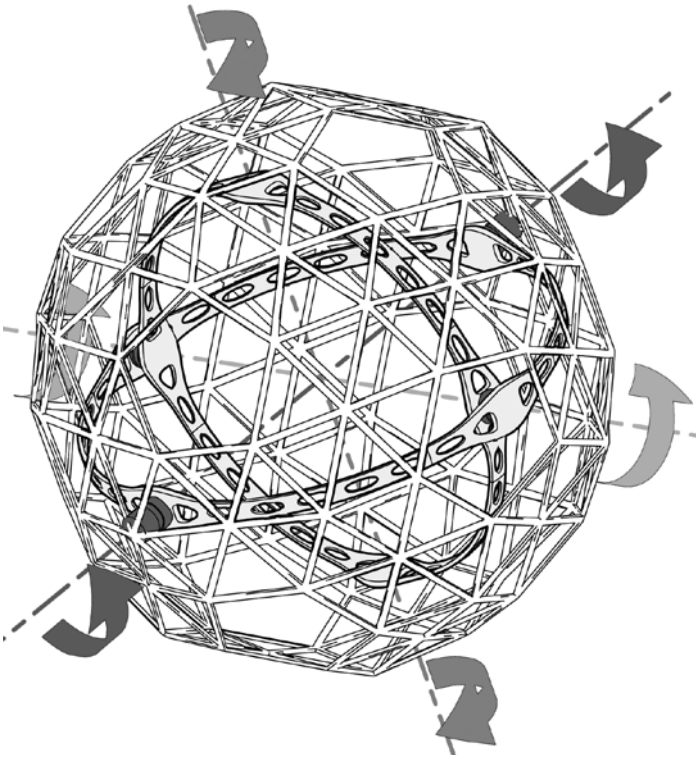


Catherine Rannou (Plouezoc'h, FR): Glacio M2 Vessel

Environmental Impact: the requirement for the building to be self-sufficient and also to have negligible impact on the environment in which it is situated is a key aspect of portable building construction. Energy generation and use, water supply, waste water recycling and processing are important aspects in this area of design. However, consideration must also be given to the embodied energy utilized in the materials and components used in the facility's construction. The use of recycled components, materials, and systems can therefore add greatly to the sustainable qualities of the proposal, and can also contribute to making it more economical and therefore more viable to produce. Though sophisticated materials and servicing systems are now available to support hyperefficient energy conservation and waste product recycling, their use must be balanced against their initial economic cost and in-use reliability in comparison to traditional "low-technology" systems.

These three crucial issues cannot of course be evaluated separately from each other, but must also be assessed on how they interact in order to create the optimum solution. For example: a lightweight construction solution might be easier to transport and less costly in building materials, but might require greater energy

consumption in use or provide a lower level of comfort to the users; a prefabricated set of components assembled on site might save considerably on transport and provide a larger facility for reduced cost but result in a long lead-in time once at the site and also have a lower standard of construction due to difficulties with the non-specialized assembly crew and weather conditions; the use of low technology recycled materials might mean a less costly and lower environmental impact manufacturing cost but be heavier to transport burning more fuel en route and in use.



Severn Clay-Youman (New York, USA): Arctic Drifter

The API competition entries included attempts at a wide range of strategies for this project. Catherine Rannou's proposal is designed to have minimal transportation costs, using very lightweight structures, such as inflatable and tension membrane surfaces. It is intended to be completely demountable so that it can be towed on a relatively small sled making use of traditional motive power, such as dogs, though it could also utilize a skidoo. This design therefore uses comparatively little energy in transportation and would be capable of relocating to many different sorts of terrain relatively cheaply; however, it does require considerable demands from its inhabitants, who must erect the entire structure

(including pumping up the inflatable and caring for the dogs) before beginning the work that is the purpose of their journey. The design by Giuseppe Mecca also takes this approach, although with a hard shell design that is much heavier, but which would also provide a more comfortable living and working environment. A crucial issue would be that because of the complexity of this design, once assembled it would certainly mean that it must be towed on its skis to subsequent locations, and these would be restricted by the availability of a substantial powered tow vehicle and the smoothness of the terrain. A compromise between these two is Benjamin Leucht's proposal: a small, compact habitat designed to be prefabricated in controlled factory conditions and transported to the Arctic in one piece. Although bulky to transport, it is self-contained and highly insulated, and would use relatively little energy with no wasted setup time by the inhabitants once in use.

Environmental impact has been addressed as a crucial issue by many of the entrants. Recycling large components for a new use in this extreme environment would not be easy; however, Laura Karnath and Carl Burdick created a building from the partial shell of a redundant aircraft, which is inherently lightweight, strong, and flexible, and manufactured to high tolerances for extreme environments. These characteristics would help with transportation considerations, but its aerodynamic shape would also be of value in the Arctic winds. One of the largest facilities proposed, this instant in-use habitat could host an entire team of workers, although transportation to remote regions by cargo-lifting helicopter would be expensive. An undoubtedly low-cost (and much smaller) recycled proposal was the creation of a flexibly sized facility using a much-upgraded Volkswagen Camper at its core by Tim Boyd. The camper is enjoyably modest and practical for temperate climates, but self-powered movement and in situ operation would probably be problematic in the Arctic. Richard Carbonnier's design engaged most thoroughly with existing systems that already have a proven record of use in extreme climates. Consisting of a simple, fixed base capable of floating on water or being towed on ice, with a quickly erected tent that expands the living space, the proposal incorporates commercially proven servicing products into a simple workmanlike strategy capable of construction close to the area of deployment. Unlikely to be built, but innovative and provocative, the Arctic Drifter by Severn Clay-Youman engages with the romance of the far north environment. It consists of a prefabricated, sphere-shaped habitat located at the center of a framework supporting inflatable pads. The intention is that the habitat will roll across the landscape, pushed by the wind. Electricity generators powered by the movement supply the facility,

which is kept upright inside on gyroscopic gimbals. To make camp, one side of the sphere is deflated to become a flat surface on which the building settles. Transportation and at least part of the energy supply (once on the Arctic continent) is therefore free, although navigation might be complicated dependant as it is on the wind direction!

Achieving the best solution for a remote-site Arctic building is a series of compromises between resources, practicalities, and ambitions, and it has to be accepted that any solution can only be considered as the best one for that moment in time in that situation. The Halley Research Station is now on model VI because its previous incarnations were deemed to be the best possible at the time they were proposed. Its predicted design life is twenty years, twice as long as its predecessor, and it is a good example of the fact that as technology has developed and experience of in situ problems accumulated, knowledge of design parameters increases, and the capacity to develop better solutions improves. Portable architecture is a field of design that is ancient, stemming from the first simple shelters set up to protect our hunter-gatherer ancestors from the elements on their lifelong journey to collect food from the landscape as the seasons changed. It remains a continually developing field of enormous creative force because as human ambitions relentlessly increase—to improve living conditions, harness more remote resources, and protect endangered cultures and landscapes—the necessity to live and work in extreme environments expands. The Arctic North is one of these landscapes and this competition has the potential to lead to another innovative design being realized that will push the boundary of knowledge and experience just that little bit further.

Arctic Perspective Design Competition Documentation

Selected Entries

THE PROJECT DESCRIPTIONS ARE BASED ON THE RESPECTIVE SUBMISSIONS TO THE API DESIGN COMPETITION.

Alexey Karachinsky

The project consists of two intersecting geodesic domes. The smaller dome contains technical equipment and domestic spaces; the large dome has a separate entrance and serves as a multifunctional space. Its interior is equipped with motion sensors and LED media screens—termed "synesthesizer."

The whole project is focused on perception of the human senses in the barren environment of the Arctic. It raises questions about the meaning of "research" and points toward human self-awareness. Consequently its presentation poster is produced as a colorful hand drawing without the use of a computer.

Carl Burdick and Laura Karnath

MARS, the *Mobile Arctic Research Station,* is exercise in sustainability and advanced technology utilizing a recycled MD-80 aircraft fuselage as its main body. Within the next five years it is expected that the majority of the fleet of MD-80 jets will be retired. This creates an amazing opportunity to put the features and design capabilities of these structures to good use.

The environment at 9,000 meters can be harsh. The fuselages are lightweight, designed to withstand winds of over 300 kph, and protect their passengers from temperatures that can go down as low as -150ºC. Readily available, these craft are simply rotting in bone yards around the world. The design utilizes as many features of the existing planes as possible. The space under the main deck is repurposed from holding luggage and fuel tanks to contain the technical equipment of the research module. The galley is refurbished to accommodate a stove, extra shelving and storage, and the rest of the passenger cabin is refurbished to remove the seats and replace them with four fold-away bunks, work stations, a rest area, and the communications equipment.

Severn Clay-Youman

The *Arctic Drifter* is designed to travel on the prevailing winds above the Arctic Circle, rolling across the landscape gathering images. When fully inflated, the Drifter presents a fifteen-meter-diameter profile, cushioned by Hypalon air-bags (a similar material is used for heavy-duty inflatable boats). Because of its size and buoyancy it is able to cover almost any flat terrain, including ice, water, and small crevasses. It is able to travel in extreme wind speeds and weather conditions that would ground most travelers. With the air-bags mostly deflated, however, the Drifter presents a much smaller dome-shaped profile, giving it stability. The inner roll-cage ensures that the crew capsule is able to remain upright. To exit the capsule, the crew deflates one of the air-bags completely and removes it.

Dustin Stephens and Alan Ho

The *Mediatech* utilizes the latest technology and materials to provide a space for interaction and comfort in the harsh Arctic conditions. While a number of sophisticated materials and systems are contained within the *Mediatech,* the strategy is simple. A compact and lightweight core containing all systems is surrounded by an air-supported envelope which encapsulates the interior space. With the use of CAD/CAM technologies the unit can arrive as a kit of parts that is assembled by local correspondents. Mobility is provided by an air cushion under the unit. During transport, *Mediatech* becomes a hover-trailer, towed by locally available small all-terrain vehicles (snowmobile, tracked-quad, snowcat, etc.).

Benjamin Leucht

The project is designed as a spatially minimized capsule. It consists of a wooden-frame base covered with a skin of EFTE film and a rigid foam top. The middle section is made of textile and mineral wool, allowing the unit to be folded down into a compact state for transportation. Insulating layers of thirty centimeters provide low heat loss. The low weight of the unit allows it to be moved on skis, using various towing vehicles and even reindeers. Energy is supplied either by solar panels integrated in the skin or by a separate wind turbine.

David Garcia Studio (David Garcia and Alanna Baudinet)

The proposal aims to look at the project as a physical and mediatic system. The habitation and working unit is resolved as a modular system that can be modified in time based on needs and technology advancements or multiplied and linked to create larger units. At the other end of the spectrum, the proposed mediatic system is a network of "cultural beacons" that allow for communication between the arctic societies and the research unit. The research unit is designed around an aluminum rectangular frame, to

which six "façade" elements are attached. These elements are tailored around the necessities for research and habitation in the interior, and shaped aerodynamically on the exterior, using this double shell system to incorporate insulation and house reservoirs. All these elements are exchangeable, interchangeable, and replaceable, due to the fact that they all fit to the same rectangular frame and are removable independently. This allows the unit to be modernized in time, or to modify its use to a more specific task.

BREAD Studio

The *Revolver* is based on the principle of a core with up to six different functional elements being plugged in. The core is a torus-like shape which provides access to the plug-in elements. These elements contain all the functional spaces like sleeping and sanitary spaces, storage, technical, and research equipment, and even a wind turbine. This allows for flexible combinations to accommodate specific tasks.

Natasha Harper with Katherine Adee and James Baldauf

This project proposes a mobile collection and sequestration system that searches the terrain for methane-rich permafrost deposits while leaving behind "off-the-grid" settlements across the Arctic landscape. As permafrost melts, it releases methane into the atmosphere.

The project attempts to capitalize on this naturally occurring phenomenon by collecting the methane for use as energy source while selectively using the infrastructure erected as the bones for new communities that would be energy self-sustaining. Methane can be extracted from the hydrate by replacing it with carbon dioxide. By doing this, both methane is harvested, and the troublesome greenhouse gas CO_2 is sequestered. This will be done with a series of pneumatic structures which are placed in states of low (suction) and high (sequestration) pressure by a series of pumps and one-way valves. During the winter season, the system of collection may be disassembled and migrate south with the rest of the nomadic village, or may be left in place in a slower more passive mode of methane collection, which would be harvested the following spring. In both cases, this roving structure is inhabited by humans for an extended period of time.

Umair Zia Malik

The project draws on techno-utopian designs with references from Buckminster Fuller to NASA's spacecrafts. It is based on close observations of natural phenomena which are transformed into an organically shaped structure. Built from high-tech light-weight materials, this structure consists of a small inhabited core, surrounded by two external layers of antennas and protection shields. The spherical shape is supposed to be moved by the wind. The utopian character of the project is illustrated by the enormous size of the sphere, with a diameter of 176 meters.

Michaelis Boyd Associates (Alex Michaelis and Tim Boyd)

Based on commonly found items and materials, most of them salvaged, the unit is based on the classic Volkswagen Transporter van, adapted to its Arctic environment through sustainable technologies and rigged sail-and-mast technology consisting of three layers. The van itself forms the base-layer, with high thermal capacity provided by polar fleece, in which inhabitants sleep. The mid-layer consists of a breathable membrane made of wool felt, where inhabitants work. The outer layer is made of rip-stop nylon, providing a water proof layer and serving as storage. A telescopic arm extends through the center of the van. Upon reaching its peak, arms are extended over and beyond the vehicle, like an umbrella. The edges are then pegged down manually.

Once the vehicle has deployed its outer, waterproof layer, the mid-layer can be unfolded. Here, a panel on the side of the van comes down and a domed metal lattice structure is extended, over which is attached the breathable wool-felt membrane.

Catherine Rannou — Plouezoc'h, FR (cath.rannou@wanadoo.fr)

Catherine Rannou — Plouezoc'h, FR (cath.rannou@wanadoo.fr)

B

⑧ rest bunks

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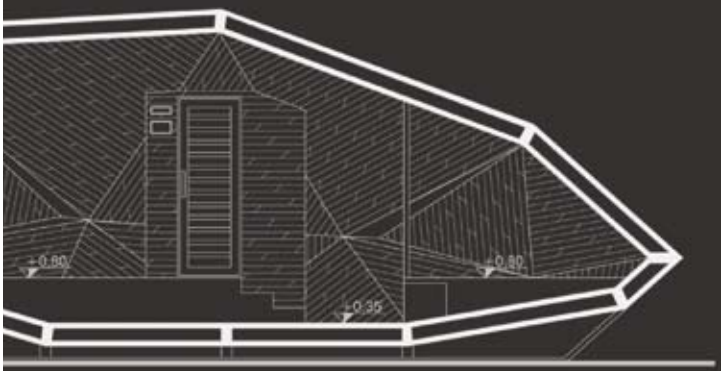

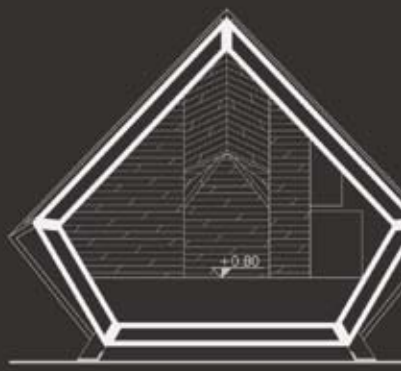

section B-B

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Giuseppe Mecca — Florence, IT (meccarc@virgilio.it)

Giuseppe Mecca — Florence, IT (meccarc@virgilio.it)

tions

LOMBARDINI

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	N (80/1269/CEE ISO 1585	5.0/6.8
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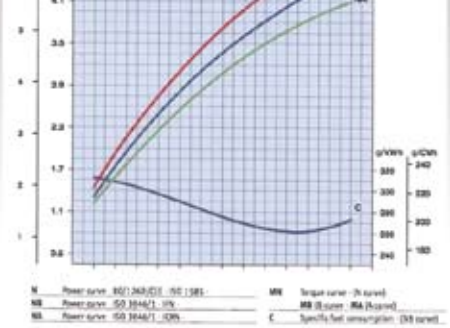
diameters for belt drive		



Reliability-Lightweight Diesel Engine

Lombardini Engines are renowned worldwide for their efficiency and reliability. Cold Weather Diesel Fuel is safer and available in the High Arctic. Unit is independent from the habitat. Fast coupling ensures electrical power, hydronic heat for the habitat. Consumption is low: estimated at 20 liters/15 days or 1.33L/day or 1.5hrs/day operation.

organizations have performed
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has designed its Model 6250 and 3500 D
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No Maintenance No Mecha
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Polar Power has met these performance
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alternator using the Permanent
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does not require brushes, slip rings,
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The PMHH technology is two
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alternator being the simplest, most
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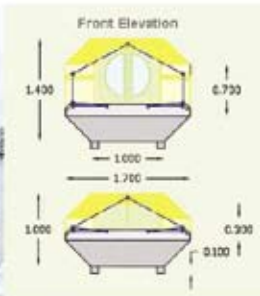
Primary Support System

Typical plywood shelter



Premise for A "Habitat Design"

Qamutik

Typical flow edge boat
welded aluminum hull

TRANSPORTA

LOGISTICS — AR

2 person = 1 outfitte
2 snowmobile + 2 Q
1 Habitat + 1 Supply

2 PERSON WINTE

SUPPLY = 2 PERS

2 Snowmobile Fuel
Co-Generator / heati
Water (start)
Food
Equipment - Clothin

Supply weight

Hauling weight 5

Inspired f

Lighting System

LED 12V lights
Marine grade units
Total load 10 units 14.4w/hr

LED. Light
Soft White surface mounted light
Low Amp Draw For Longer Battery Life (.12 Amp Draw)
Stainless Steel Mounting Hardware
Impact Resistant - 100% Waterproof - Low Heat

Wind Power System

Reliable Marine Turbine
Proven operation in extreme environments.
Self fettering, generator brake unique technology
prevents damage in strong winds.

Habitat mounted
Operation, traveling or stationary.
Hinges provide easy maintenance and deicing if required.
400 w/hr weight 5.85 kilo

Solar Sy

Solar Blanket Two (2)
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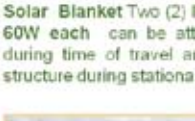


	48 inches (1.15m)
	13 lbs (5.85kg) (Shipping: 27"x15"x9" (686x38x228mm) / 17 lbs (7.7kg))
	1.5" schedule 40 pipe (1.9" OD, 48 mm)
ed:	7 mph (3.13 m/s)
	12 and 24 VDC (36 and 48 VDC available soon)
	400 watts at 28mph (12.5m/s)

Southwest Windpower AIR-X

CONSERN

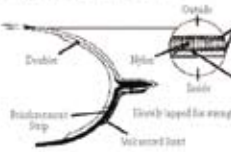
Heat Exchanger Model 30

Eberspächer

Exhaust Heat Exchanger converts the waste heat from the engine exhaust for hot water, steam, and space heating.

Nanta Flexible Tanks provide many advan tanks and have, therefore, become very pop yacht builders and boat owners.

Each of these tanks uses an extremely rug nylon fabric, coated on both sides with a n compound. Heavily lapped seams are inside-re "doubler" to provide extra strength.



gen Barrier PEX

xygen Barrier PEX-b signed for radiant heat is tubing meets ASTM d is pressure tested to 100 at 80 psi. This tubing year warranty.

brazed plate liquid-to-liquid

Lightweight Titanium Heat exchangers

Lytron

Cogeneration unit - Delta12 .9 Kilo.

EL-SID Pumps 10B12volt 1A

	V	12	
		High	Low
	W	4300	1500
nut 0.1 bar)	l/h	900 ± 100	
	W	48	23
	l/hr	0.53	0.27
	mm	220 x 86 x 160	
	kg	2.90	

DIESEL HEATER Safety – Efficiency

Eberspacher 4.3Kw Weight 2.9 Kilo.
Hydronic – radiant heat - hot air/water
Consumption estimated at **80 liter/15 day or 5.33 liter/day or .23 liter/hr**

Reliable & Renowned Technology

Habitat mounted - Light weight - compact
Fuel pump / hydronic pump/ thermostats
Habitat zoned radiant & air heat
Domestic hot water heat exchanger
Ice smelter kitchen sink

Polar Power co-generation

3Kwhr hydronic Heat Exchanger
(Available energy- Genset run time 1.5 Hr/day)
Fuel & glycol fast coupling connection

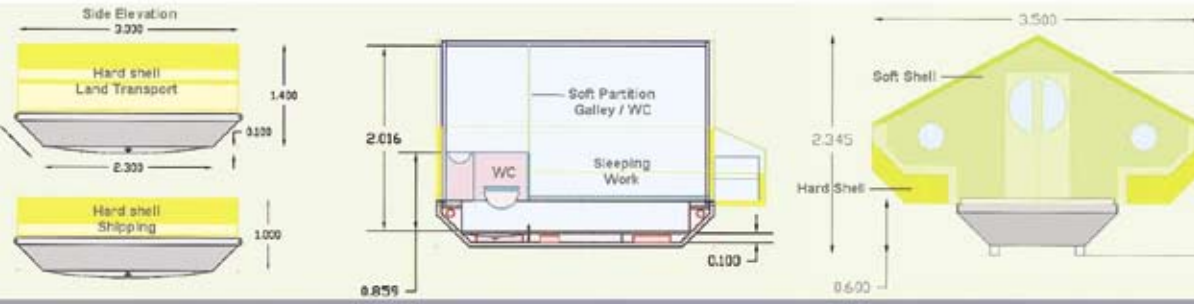
Water
Neoprene/Nitrile with Tedlar" Liner including fittings and spanner wrench (2 x FTP 1216, FTP E500, FTP 010)

Sewage Holding or Small Diesel Fuel: Neoprene/Nitrile with Tedlar" Lining

Sewage Holding Neoprene/Nitrile with Tedlar" Lining Complete with Fittings Installed (2 x FTP 2221, FTP E500, FTP 010)

Large Diesel Fuel Neoprene/Nitrile Complete with Tie Down Straps & Bronze Fittings Installed (FTP 3254, FTP 2254)

Heating Systems



1.7M x 3M x 1.4M = 6.4M3 | Fully Deployed Habitat Section | Deployed Entrance Elevation

cost $ 10,000 CDN
cost $ 15,000 CDN

HABITAT DESCRIPTION — OPERATIONS

Transportability and deployment is simple. The habitat will sustain life for 15 days or more. Human relation and privacy is preferred in pairs with two person per habitat. Design is modular and adaptable for leisure, work or both. Systems are simple, interchangeable and accessible. Back to back configuration will accommodate more space if required.

vances a concept that captures the essence of this understanding, embracing techniques,

rature range	32 F - 140 F (0°C - 60°C)
ture range	-22°F - 158°F (-30°C - 70°C)
	Optional dust, GFCI receptacle
	Hardwire (transfer relay option)
	Removable, can be mounted remotely
	Displays DC volts, amps and output power
C fuse	150 A
W x D)	4.5 x 11.0 x 15.4" (115 x 280 x 390 mm)

Inverter System

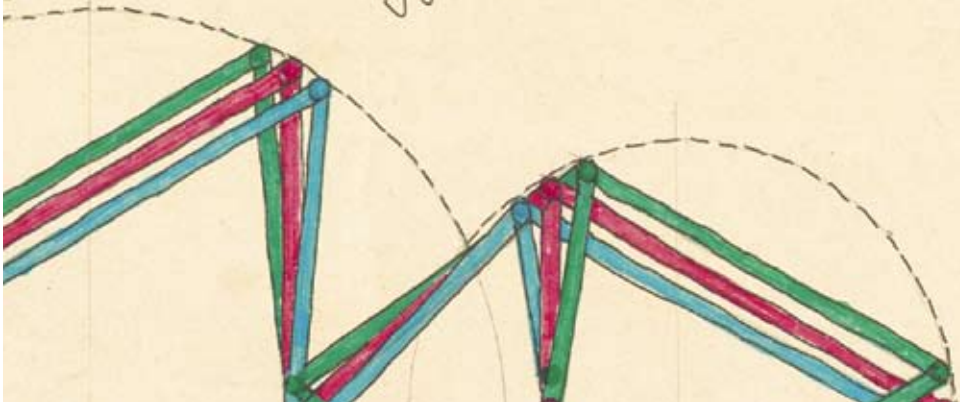
12Vdc /120Vac

xantrex

Xantrex inverters are well renowned. Pure sign inverters will provide quality power to sophisticated instruments.

Specifications:	Character
Type	: Rechargeable Nickel M Hydride Prismatic Cell
Model	: QNF100
Nominal Dimension	: 112×34×180mm³
Weight	: about 1.5Kg
Nominal Voltage	: 1.2V
Nominal Capacity	: 100 Ah at 20A discharg Cell at 20℃
Specific Energy	: 63Wh/Kg at 0.2C disc

scheme of energy distribution inside pavilion flo



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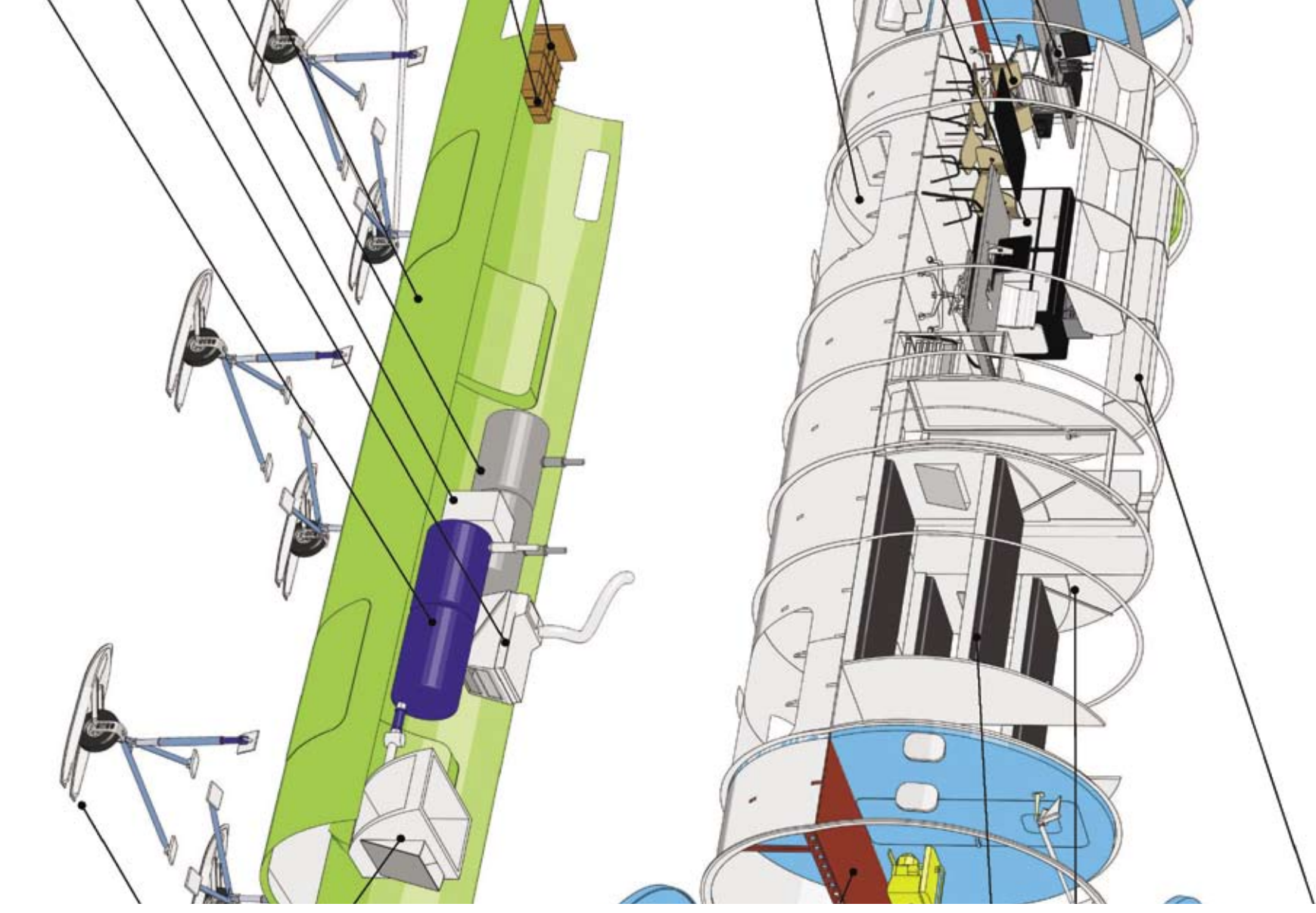

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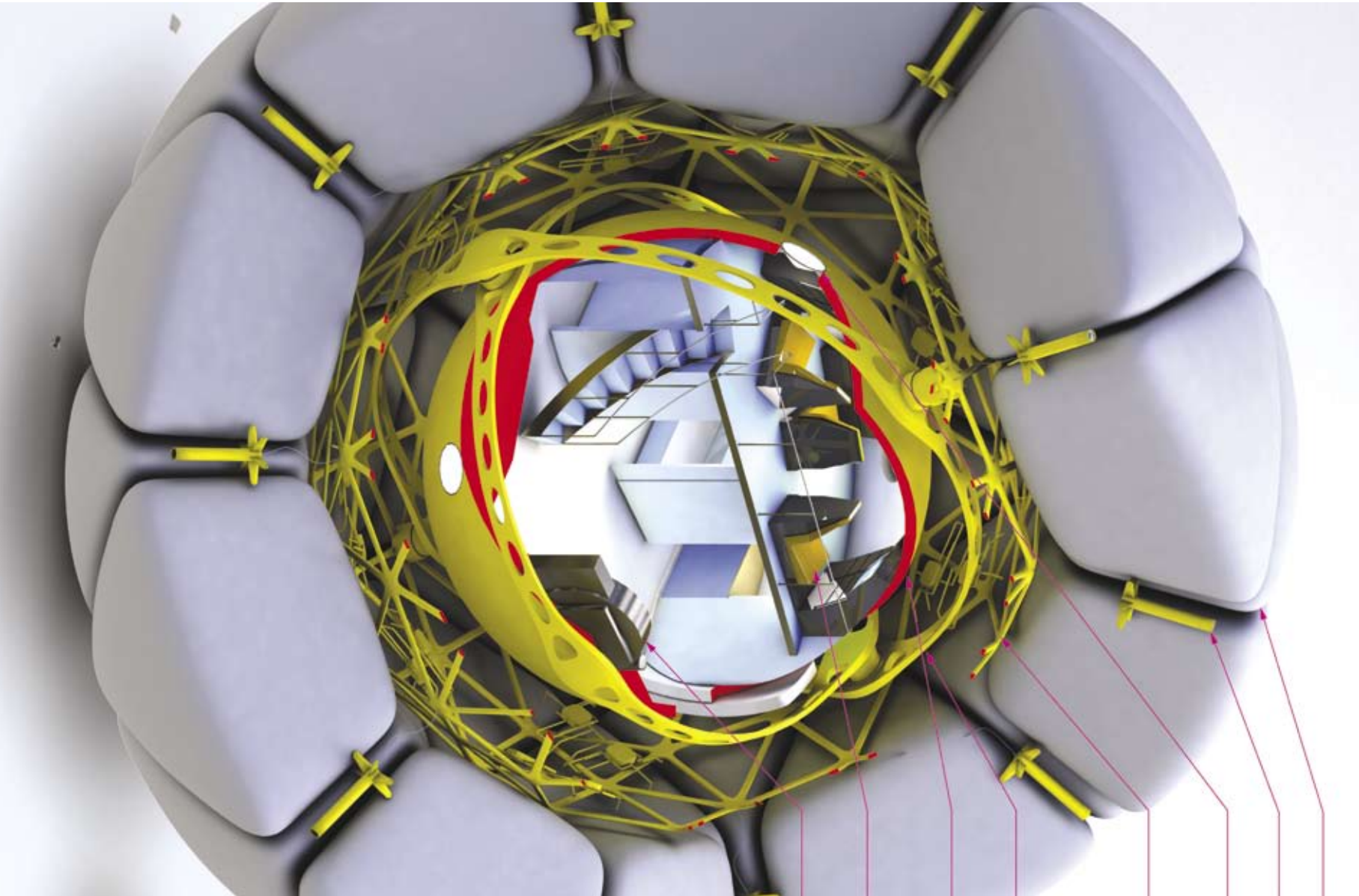

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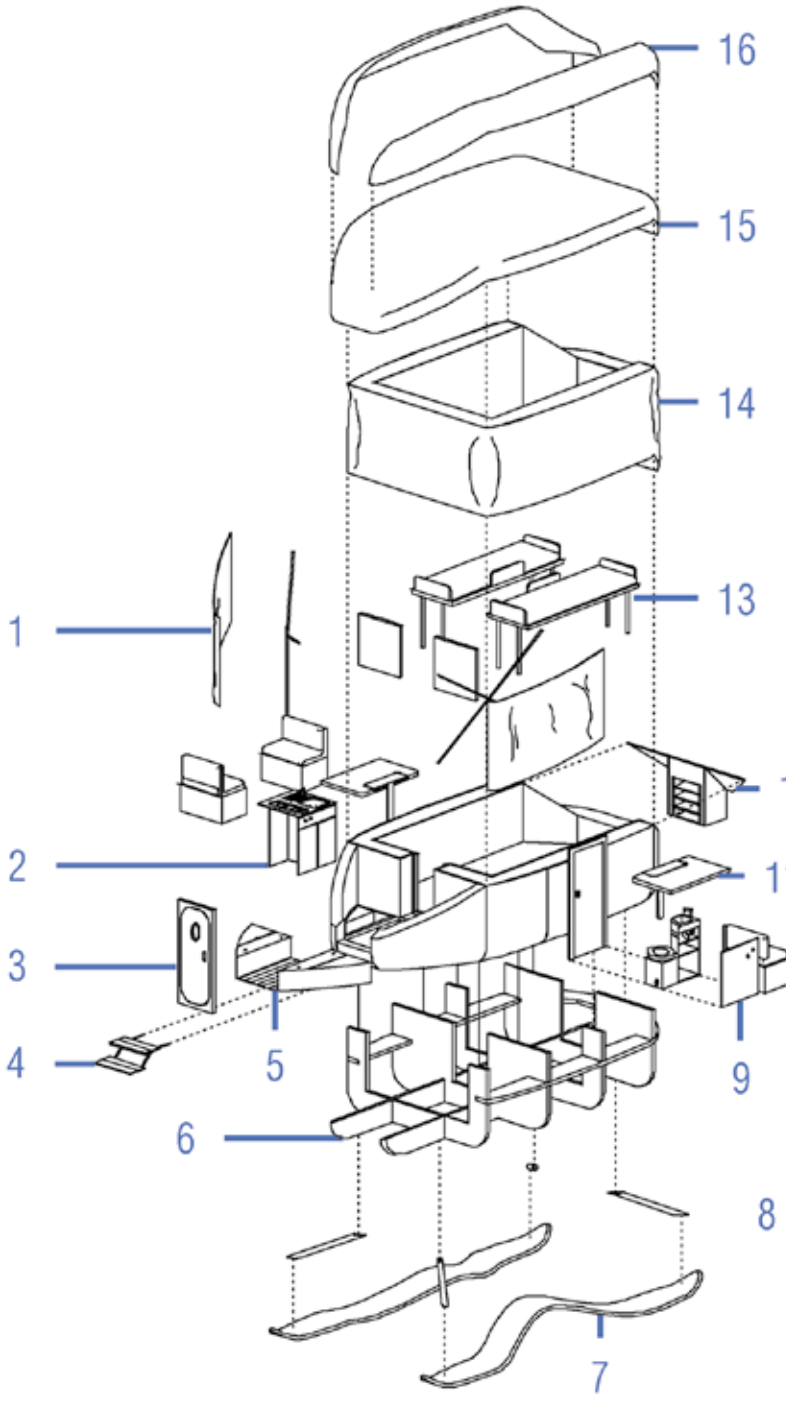


1 E T F E - f
250 µm strength
double layered

2 kitchen installation
sink and two gas coo
butane gas bottle)

3 removable entranc
Schleuse
sluice, 70 mm da
foam door/ GRP bon

4 removable entrance
access, 2 steps 19,0

5 a hatch to the batter
40 mm pine wood

6 former-construction
firmness of the body
wood, partly perfo
weight reduction

7 vats, 30 mm stainles
mm GRP covering

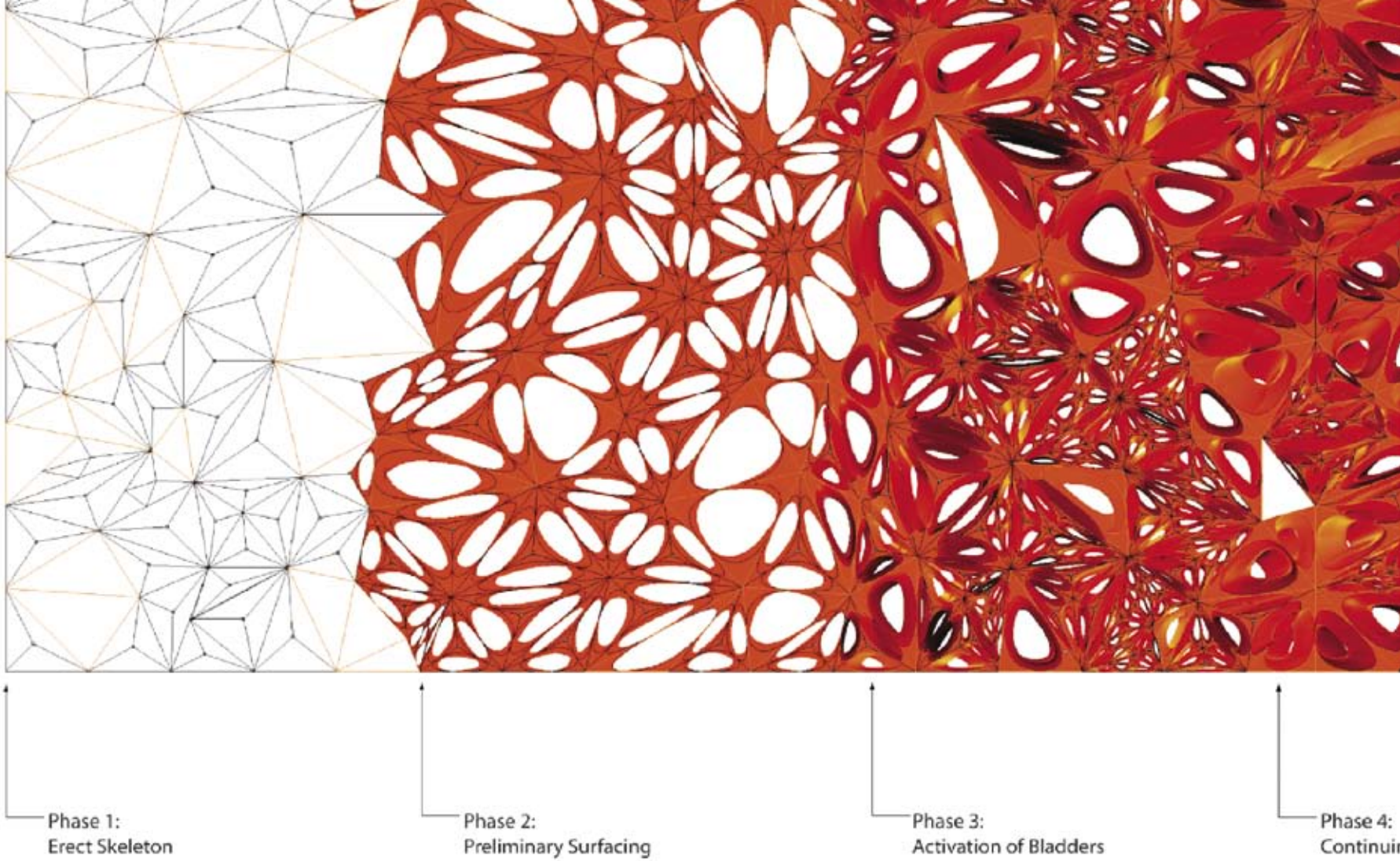
8 aluminium pipes
Ø 70 mm hollow pro

BODY EXPLOD

Benjamin Leucht — Leipzig, DE (benjaminl@web.de)

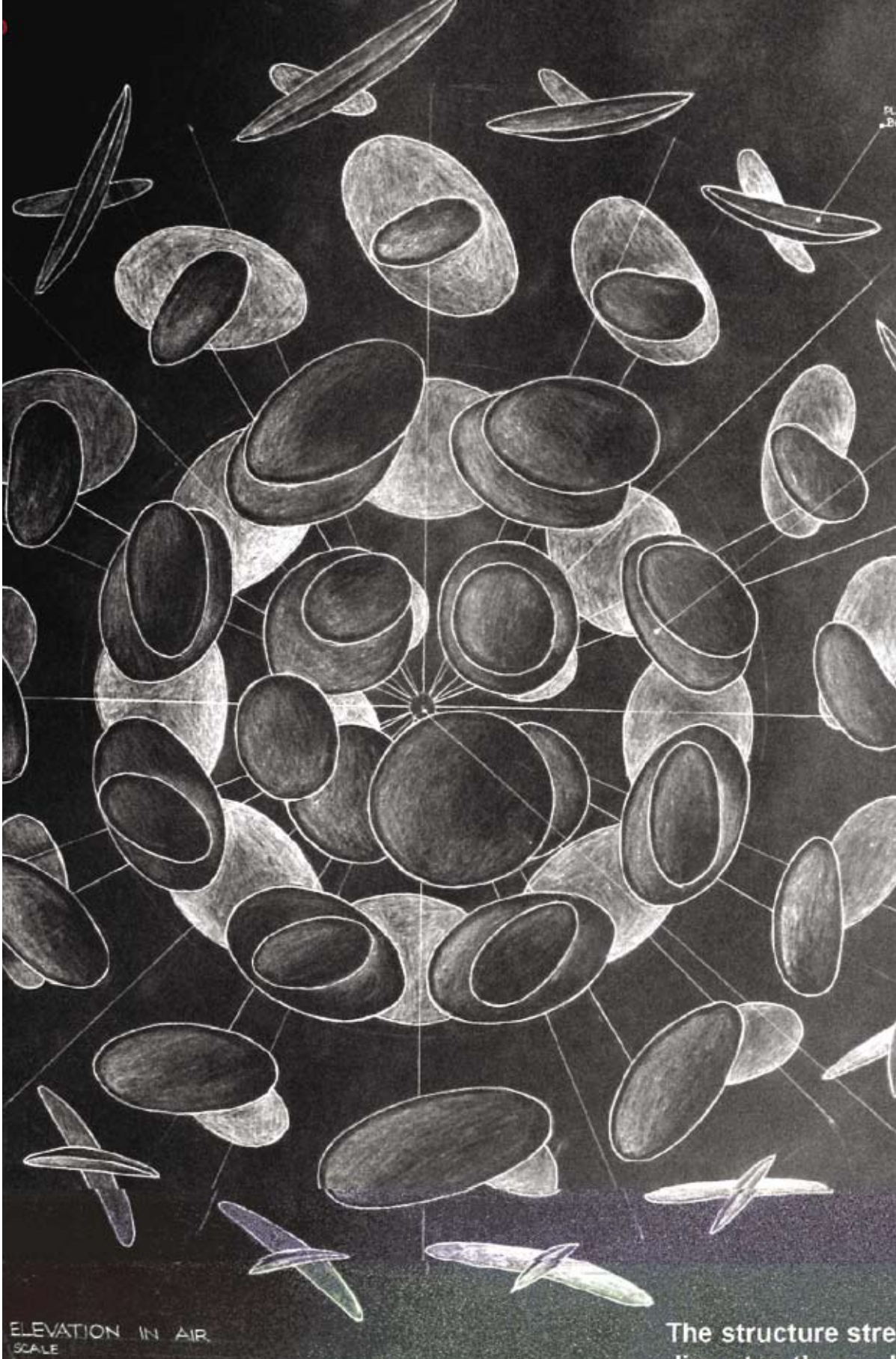
David Garcia Studio (David Garcia and Alanna Baudinet) — Copenhagen, DK (www.davidgarciastudio.com)

BREAD Studio — London, UK / Hong Kong, CN (www.breadstudio.com; paulmui@breadstudio.com)

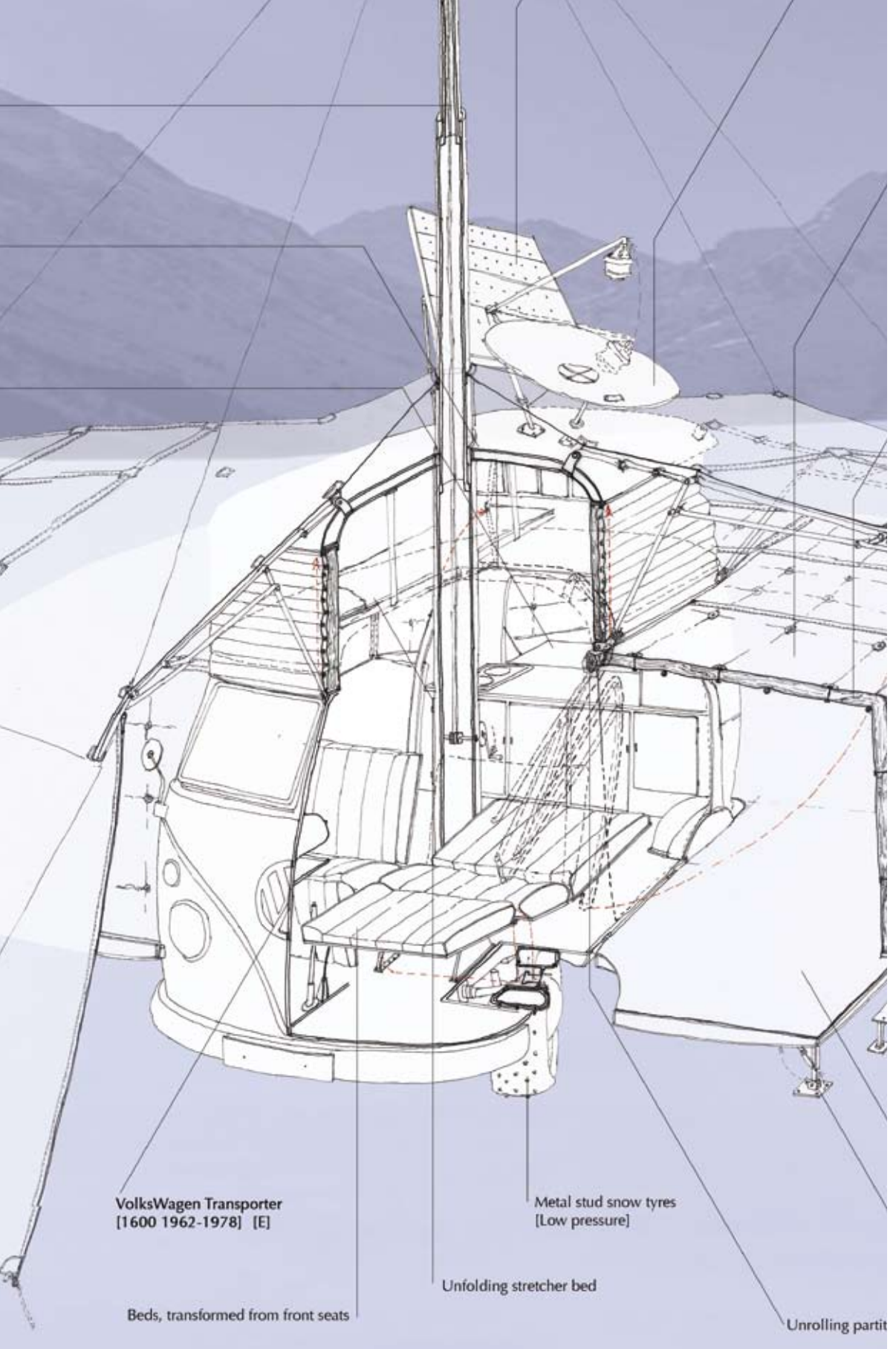


Growth of the system showing the collection process through bladders that become filled and are then removed.

Natasha Harper with Katherine Adee and James Baldauf — New York, US (harpernatasha@gmail.com)



Umair Zia Malik — Lahore, PK (umairzia@live.com)



Michaelis Boyd Associates Alex Michaelis and Tim Boyd — London, UK (www.michaelisboyd.com, info@michaelisboyd.com)

Arctic Perspective Cahier No.1

PART 2

Circumpolar Shelter

Marilyn Walker

The far north and its people have fascinated outsiders for centuries. Circumpolar peoples have survived, even flourished, in one of the most extreme environments on earth. Their built environment reflects a creative, dynamic response to severe limitations of resources, climatic conditions, and subsistence options. Yet, the diversity of circumpolar shelter strategies is not widely acknowledged by outsiders. Nor is there recognition of how traditional skills to do with living "on the land" can be incorporated into contemporary housing designs and community planning.

This paper provides an overview of shelter forms and functions in the far north, relating them to their historical and ecological contexts. From a huge database, I select a few examples to convey the geographical, temporal, and seasonal diversity across the extent of the circumpolar world—Greenland, the Canadian Arctic (including Labrador and Arctic Quebec), Alaska, Beringia and the Old Bering Sea area, Siberia, and parts of Mongolia. This cultural continuum has its roots in Central Asia—from here, migrations moved into Beringia, and then into the Americas and Greenland. Pre-Dorset, Dorset, Thule,[1] and other Arctic Peoples adapted to changing climatic conditions to diversify into the wide range of circumpolar cultures found today.

Prior to contact, Arctic Peoples were nomadic with only a few areas able to support a larger, more settled population. Upon contact, new materials and technologies became available along with new social conventions and lifestyles, including new housing designs. Across the North, Arctic Peoples came under state systems (Russian, American, Canadian, or Danish) with unfamiliar sedentarization and assimilation policies; these dramatically altered their relationship to the land and also to each other, as did religious conversion from a shamanist way of life to Christianity and Buddhism. The impact on indigenous ways of knowing and being and their relationship to space and place has not been well studied by the outsiders who introduced and sometimes imposed these changes.

Ecological and Cultural Diversity

Described as an ecozone because of its distinctive tundra landscape and high latitude, all areas of the Far North share a characteristic cold climate and extreme seasonal fluctuations in daylight.

1
These are ancestral Arctic traditions preceding modern day Inuit and other Arctic Peoples.

Particular flora and fauna (some unique) and distinctive raw materials for building, such as snow and animal hides, are also characteristic. The challenges and opportunities presented here to Indigenous Peoples and newcomers alike are unlike those of any other region in the world. Yet to think of it as homogeneous would be misleading. Siberia and the Russian Arctic, for example, are inhabited by more than thirty distinct ethnic groups, each with their own interpretations of prototypical Arctic shelter strategies.

King Island village, 1949; Bering Sea Patrol. Overall view of village from water; Photo credit: Alaska Historical Library

While it does impose severe limitations in terms of dispersal of materials and subsistence options, the region is extremely diverse ecologically and culturally. In places such as the Mackenzie Delta, for example, there is no clear delineation between tundra and forest, so some peoples had access to wood for building materials. Off Herschel Island, huge driftwood trees were dug into the sand, their root ends upright to support a roof of skins. Along the northern limit of the trees, the southernmost Inuit utilized forest resources for tent poles.

Some Arctic Peoples hunted sea mammals along the coasts, while others relied on inland resources such as caribou and fish; others took advantage of both habitats. Beringia, which escaped the last Ice Age, provides a diversity and concentration of flora and fauna not found elsewhere. Rich marine resources allowed for permanent settlements and a more concentrated population. Alaskans built year-round villages, some of which were inhabited for centuries; these were large, semi-subterranean, log-walled houses covered with turf for insulation and heated by lamps that burned

sea-mammal oil. On King William Island, wooden stilt villages were constructed on the rock faces.

Circumpolar peoples responded with skill and ingenuity to changing climatic conditions, combining local materials with new resources as they became available. They made shelters from sod, bark, animal skins, and whale bone, earth, logs, saplings, grass, moss, sticks, snow, ice, stone, and later introduced materials such as canvas, plywood, and even reworked oil drums. They took advantage of the insulative properties of hollow caribou hair, the waterproof capacity of sealskin, and the thermal benefits of animal fat to heat a living space efficiently. They knew how to distinguish among the different snow types and how to maximize the limited light of the far north. Windows were cut from ice or made from walrus intestine or seal gut. But hides also allowed light in if those with hair on were used for the back of the tent and dehaired hides were placed at the front. Once glass windowpanes were introduced post-contact, people packed them along with their other belongings when they moved camp.

In addition there are always individual aesthetics that go beyond the strictly functional. I asked Tongola Sandy why he was so particular about where he left the ventilation hole in a snowhouse he was building. In the Inuit way of "show, don't tell," he laid a caribou hide out for me on the interior platform, then told me to lie down and look up. "I like to look at the sky when I'm lying in my snowhouse," he said. "It's so you can see a star."

Cultural Values

Outsiders' views of northern lands and peoples reveal as much about the chroniclers as about the subjects of the encounters. Labrador was one of the first places newcomers landed in the Americas—Jacques Cartier called it "the land that God gave Cain." Europeans struggled to find something to connect with, something familiar in this vast landscape they named as barren, an Arctic wasteland, and an untamed wilderness. And what about the people they met? Not much about native spirituality seemed to fit into the European dichotomy of "man" versus "nature," but impressions and judgments were as varied as the backgrounds and aspirations of the newcomers themselves.

The Aharmiut, among the best-known Inuit of Canada at the time, were featured on the April 12, 1956, cover of *Life* magazine for a story on primitivism. As inland people of the Ennadai Lake area near Churchill, Manitoba, they relied almost entirely on caribou—in the cover photo they are dressed in caribou-skin clothing. Winter

homes were made of snow blocks topped with a roof of caribou skins, all supported by wooden tent poles which they obtained from the forests at the southern limits of their range.

Summer dwellings were conical tent poles made of caribou skins and canvas. Labeled "Stone Age Survivors" on the cover, they were stereotyped as childlike innocents who lacked any concept of time in the Western sense and were unwilling or unable to take present action for future needs. Other Inuit were portrayed as cruel, bloodthirsty, superstitious heathens whose souls (if they had any) could be saved by settling them into permanent southern-style dwellings.

Alaskan sod house; Photo credit: Anchorage Historical and Fine Arts Museum, Alaska

Labrador Inuit required a highly mobile lifestyle to access the varied resource base on which they relied. Aboriginally, they lived in small scattered bands. After Moravian missionaries established their first Labrador mission at Nain in 1771, the Inuit nomadic lifestyle was subsumed by Moravian ideas of a Christian community. Moravians imposed order on the chaos they perceived by building sod-covered huts in a straight line, a practice that the Inuit initially resisted but eventually gave in to.[2] An 1861 estimate noted that about seventy-five percent of Labrador Inuit along the Labrador coast were under Moravian influence and living in single-family homes with clocks and mirrors, iron stoves, and glass windows. The

2
Periodical Accounts 26:365-6, 1866. Periodical Accounts were published annually between 1790 and 1961 by the Society for the Furtherance of the Gospel.

remainder—"heathens" or northlanders—continued to live in earth and sod-covered semi-subterranean huts heated with traditional oil lamps and portable stoves.

As a primary indicator of cultural transition, shelter chronicles the historical impact of external contact: direct contact with Cossacks and Russians, Europeans, Subarctic and other Arctic Peoples and with traders, missionaries, explorers, adventurers, and government officials, whalers, and fur traders. It also records indirect contact and cultural transmission from regional conflicts, travel, disease, and trade. Early impressions—romantic or realistic—became archived in the public imagination. Still today, outsiders hold many misconceptions about life in the North, including about its shelter. How many of us associate the North with the snowhouse? Webster's, for example, defines *igloo* as "a domed Eskimo hut, made of blocks of snow and ice." In Inuktitut, however, *igloo* or *iglu* means any house regardless of the material from which it is built. The snowhouse was actually a seasonal dwelling used in parts of the Arctic and dependent on suitable snow conditions.

The Sources—Historical and Ethnographic

Archaeology provides evidence of the precontact built environment. Thule winter houses, for example, were semi-subterranean dome-shaped structures constructed of a whalebone rib frame and covered with sod and hides. Thule homes were often built directly over Dorset and sometimes pre-Dorset dwellings as all peoples sought the best campsites—availability to their subsistence base, beaches with landing sites for their watercraft, protection from high winds, vantage points to look for animals, or places where the tides floated in detritus such as driftwood. In the high Arctic, Dorset peoples built the longest dwelling of its kind in North America as communal living space. Measuring 45 x 5 meters, it probably served as a foundation for a row of skin tents for a seasonal summer community of about 100 people.[3]

Field sketches, wood engravings, and lithographs are a rich source of archival information on circumpolar shelter at the time of early contact by outsiders. Once printmaking was introduced to the Canadian Arctic in the nineteen-fifties, dwellings were a not uncommon topic and even the carving industry used shelter as subject matter. Photographs provide an especially rich database

3
Excavated by Peter Schledermann, Director, Arctic Institute of North America, Calgary.

that documents new technologies, structural adaptations, and lifestyle changes.

The ill-fated last Franklin expedition was the first to the polar regions to include photographic equipment, but no photographic plates or equipment from it have been located. The Franklin rescue expeditions that followed carried photography equipment. One of these was the 1848 overland expedition led by Sir John Richardson, but the equipment was apparently never put to use.

Captain George Comer took early photos in the Hudson Bay area of Inuit snowhouse interiors dated 1901 and 1902. Comer also collected data and specimens for Franz Boas and the American Museum of Natural History; however, Boas's pioneering report on the Central Eskimo[4] does not include photographs, relying instead on diagrams and drawings of house plans.

The British Arctic Expedition of 1875–76 photographed the Canadian Arctic and Greenland. A series of Greenlanders was taken between 1860 and 1865 by Dr. Hinrik Johannes Rink and includes photos of Greenland dwellings. It was not until the mid-eighteen-seventies, however, that photographic equipment became standard on exploring expeditions.

Roald Amundsen (1872–1928), a Norwegian who overwintered on King William Island 1903–05 north of Hudson Bay, came to admire the Netsilik[5] of what is now Gjoa Haven. During his stay, he amassed a large collection of tools, tents, sledges, and other items as well as photographs. He and his crew studied native ways, learning to hunt and fish and to build snow huts. Amundsen observed a Netsilik camp consisting of sixteen snow huts, the largest he ever saw. While he recognized the sophistication of the snow hut, Amundsen did not regard their summer tents in the same way. These he saw as "no triumph of art. Most of them are made of reindeer and seal skins sewn together. The best seal catchers have theirs made entirely of seal skin. . . . Seal skin is more precious than reindeer skin."[6]

The Canadian Arctic Expedition (1913–18) produced a large collection of photographs of Copper Inuit camp life from Alaska through the central Canadian Arctic.[7] Among the photographers

4
Franz Boas, "The Central Eskimo" in *6th Annual Report of the Bureau of American Ethnology for the Years 1884–1885* (Washington, 1888), pp. 399–669.

5
Netsilik is the term used in the original text. *Netsilingmiut* means "people of the ringed seal" as a term of self-designation.

6
Roald Amundsen, *The North West Passage—The Voyage and the Exploration of the Gioa 1903–1907* (London, 1908), p. 121.

7
For a review of Copper Eskimo snowhouse use, see Diamond Jenness, "The Life of the Copper Eskimos." *Report of the Canadian Arctic Expedition, 1913–1918* Vol. 12A (Ottawa, 1922), pp. 65–76.

were Vilhjalmur Stefansson and Diamond Jenness. Stefansson was respectful of his subjects and fascinated by their dwellings, especially the snowhouse which he saw as technologically ingenious and extraordinarily adaptive in its design. It appears to be the most common image in his collection; of his Arctic lantern slides, ten percent are of snowhouses including a sequence of nineteen that depict the building of one. He also photographed joined snowhouses. As interested in the process by which dwellings were built as in their form and function, Stefansson included a diagram of a sod and timber house as well as photo documentation of Eskimos[8] excavating the ground and erecting the framework. He portrayed the Inuit as exemplary in their adaptation to an environment they viewed not as "barren" but as a land of plenty for those who knew how to access its riches. Perhaps Stefansson is the originator of the snowhouse as a symbol of the Arctic in the popular imagination.

Eskimos at Cape Prince of Wales in front of sad house (barabara). Whale rib and sod house; Photo credit: Alaska Historical Society

Peter Pitseolak (1902–1973), the first native documentary photographer of the Canadian Arctic, photographed, drew, and painted the south Baffin Island area. His celebrated work provides

8
Where the original title, text, or photograph uses the term *Eskimo* it is retained. In early accounts, *Eskimo* was spelled *Esquimaux*. The use of either term is problematic in that both were applied historically to "Indian" groups such as the Micmac, or other Subarctic aboriginal peoples. In contemporary use, self-designation as *Inuit* is common in west Greenland and Canada; *Inupiat* is common in North Alaska; and *Yuit* for Siberia and Saint Lawrence Island. In the nineteen-seventies, the term *Inuit* replaced *Eskimo* in government and scientific publications and the Inuit Circumpolar Conference meeting in Barrow, Alaska, in 1977 officially adopted *Inuit* as the designation for all Eskimos, regardless of their local uses. Linguistics refers to the Eskimo language family or to the Inuit-Inupiaq language grouping; archaeology refers to an Eskimo/Arctic complex, e.g., *Inua: Spirit World of the Bering Sea Eskimo* by W. W. Fitzhugh and S. A. Kaplan.

an insider's view of the last days of camp life, emphasizing material culture including dwellings. He wrapped his camera in caribou skins when traveling and stored it on top of his hunting iglu until the film was used up so as not to subject it to temperature changes. He and his wife, Aggeok, developed the film on top of their sleeping platform using two kudluks (oil lamps) for heat.[9]

Eskimo Point (now Arviat) 1932/3"; Photo credit: Fleming Collection, Prince of Wales Northern Heritage Centre, Yellowknife

Among the first photographs to be taken in western Alaska of Alaskan Native Peoples are those shot between 1879 and 1881 by Edward W. Nelson. These document the lives of Yupik, Inupiat, Ingalik, Siberian Yupik, and Chukchi Peoples of western Alaska and their neighbors in Chukotka. They are also among the first to document Native Peoples of the Bering and Chukchi Seas region at a time when Alaska was little known and contact with Anglo-American outsiders was just beginning. One photo shows a Yupik family wearing trade cloth in front of a canvas tent, while another, of Chukchi near Cape North, Siberia shows little evidence of European materials in the clothing. Another pictures a native village alongside a European log house. Documented are village scenes and architectural details of dwellings, a Chukchi tent made of walrus hide over a pole support, Aleut villages in Unalaska, and sod houses at a Yupik village on the lower Yukon.[10]

9 Dorothy Harley Eber, "Peter Pitseolak: A History for Seekooseelak", in D. Bellman, ed., *Peter Pisteolak (1902–1973): Inuit Historian of Seekooseelak* (Montreal, 1980), p. 14.

10 William W. Fitzhugh, "The Alaska Photographs of Edward W. Nelson, 1877–81" in J.C.H. King and Henrietta Lidchi, eds., *Imaging the Arctic* (Vancouver, 1998), pp.125–42.

Another important Alaskan photograph collection is that of Marvin Sagvan Peter (1911–1962), the son of a reindeer herder. Depicting Barrow life in the nineteen-thirties, forties, and fifties, it shows an Inupiat community that was adapting to the twentieth century but before statehood and the oil pipeline era. By the time Marvin was born, southern-style houses were being built and the *qargi,* or community house, had fallen into disuse.[11] One of Marvin's photos shows a Barrow family in the later nineteen-forties in front of houses made of boards with metal chimneys and banked on the viewer's side with snow. On the roof are hides and a seated dog that presumably finds the roof warmer than the ground.

The Arctic collection of "frontier" photographer Edward S. Curtis (1899) includes a Siberian winter house of whalebone and sod with a walrus hide roof. Another is of a village of summer tents in Plover Bay; some are canvas, others skin. Curtis posed many of his photos and even added foreign elements to some but they did capture the public imagination. Curtis's goal was not just to photograph but to document as much traditional life as possible before that way of life "disappeared."

The Snowhouse

A compilation of words related to ice and snow (from Northern Quebec, Labrador, and Eastern Arctic dialects, the Aivilik dialect, and the Igloolik dialect)[12] totals over 100 words; among them are these words about ice and snow as construction materials:

AUVIQ snow block for iglu construction
KATAGARJUK frost crystals that fall from the roof or window of a snowhouse
QANGAALUK fine snow or frost particles which fall from the ceiling of an igloo
QIKUK hole eroded by the wind in the wall of a snowhouse
QIKUUTITSAJAQ powdered snow applied to the cracks in the wall of a snowhouse

I am sitting at the breakfast table with a group of Inuit in Churchill, Manitoba—we are talking about snow and iglu building. Among

11
Chris Wooley and Karen Brewster, "More Than Just Black and White: Marvin Peter's Barrow Family Album." J.C.H. King and Henrietta Lidchi, eds., *Imaging the Arctic* (Vancouver, 1998), pp. 143–47.

12
Compiled by John MacDonald, Igloolik Research Centre, Science Institute of the Northwest Territories, N.W.T.

them is Linda Gibbons who was born in Churchill and grew up in Arviat. I ask her if women build snowhouses. "Yes!" she replied, "I do," and she described a female relative who was a really good iglu builder—"better than a man." The elder Tongola Sandy tells me how important it is for women to help in iglu construction. Experienced ones can select the right snow for filling in the cracks between the snow blocks—*qikuutitsajaq*. The right snow ensures proper insulation and makes the iglu last longer. Tongola grew up in Coral Harbour in an outpost camp. In his fifties when I met him, he was living in Rankin Inlet and came to Churchill to teach iglu building to a group of scientists.

Joined skin pole tents, Banks Peninsula, Bathurst Inlet;
Photo credit: R. M. Anderson, National Museums of Canada, Ottawa

Tongola likes to use a harpoon as a snow probe *(sabgut)*. He puts a chunk of snow in his mouth to melt it into slush and then presses the slush onto the tip of the probe, leaving the tip exposed by about half an inch. He repeats this a few more times until the end is bulbous with its ice coating. By pushing it into the snow, he can distinguish the different layers to determine if a location will be right for an iglu. I ask him about his *pana* or *pannak* (snow knife): "The length of it doesn't matter. You don't have to cut all the way down to split the 'log' off. The first block has to be slanted a little bit inwards. If this one is too straight, the iglu will bend 'out.' The second block, adjacent to it is full-size. If the first blocks are 'straight up' you get a tall iglu—this is not what you want, it won't be strong. So you angle the blocks to get a nice dome shape.

"There's more snow on the south side of a hill so you level a bit first. You put your first block down because snow itself is kind

Dukha Reindeer Herders (Tsaatan) moving summer camp, taiga, northern Mongolia, 2006; Photo credit: Marilyn Walker

of slanted—it's easier to work that way. They always said not to build an iglu against the south side of the hill—it might collapse on you. (A bank is okay.) At the beginning of April, snow is too soft to build with, so we make buildings that are half snow with canvas on top. There's a lot of transport snow, which is snow blown in by the wind. It's best to look for a 'good' drift which will have a distinctive sound and feel. Snow needs to be of uniform density and hardness for the whole block so it doesn't split. Layering produces weakness in the blocks so you don't want a mixture—the best snow is deposited by a single storm event."

Mug Up After Christmas Eve Mass. Pelly Bay, N.W.T. c. 1956 in K'agguk (big iglu); Photo credit: Father Guy Mary-Rousselière, Eskimo Museum, Churchill

The snow in Churchill is not good for iglu building. "Here the snow is in deep piles," he says, "We build iglus where the ground is a meter or less down. Close to the ground the snow is usually coarse—that makes it soft; you need it soft at the bottom because then it's easier to make the undercut. When the snow is too hard, it's hard work on your wrist trying to square it."

He uses the probe to draw a circle in the snow around himself as the pivot point. This makes an iglu big enough for two people. For an iglu this size, he works by himself, but for a larger one, say for four people, several people usually work together. "Because of the poor snow quality here," he tells me, "it took me longer than usual to build an iglu earlier—about two hours. But some people can build a two-person iglu in forty-five minutes. At Christmas time there's an iglu building contest for the fastest and the best. I'm not really fast. Some people are—lots of people from Coral Harbor are

really fast! And still today they might build a big iglu to hold twenty to twenty-five people for a meeting or get-together."

Is it still important to know how to build an iglu, I ask? "Today, if the younger guys get lost, you have to go out and find them right away. They don't know how to make an iglu and will freeze to death. Always in our region, one person dies each year because they don't know how. And by looking at the wind patterns in the snow as you leave camp to go hunt or whatever, you can find your way back."

I ask him what he thinks about when he is building an iglu. He takes a moment before answering: "I think about what my father taught me. My father taught me how to build an iglu. One thing he told me is never to build an iglu beside a snow bank. If you build close to it and stay in it for a day, it may collapse on you because snow builds around it and on top and there will be too much weight. He also taught me that sometimes the wind is so strong you can't go anywhere; you just have to stay in till the storm is over. Once in a while there's a strong wind and the iglu will get thinner and thinner so it's better to use a snow shovel *(nivautaq)* to make it thicker especially if it's a north wind. This makes it warmer too.

Eskimo Village at Igloolik 1979; Photo credit: Eskimo Museum, Churchill, Manitoba

"My father also told me not to build an iglu in the middle of a lake especially in fall when the ice is not too thick. If you have to stay for a day and there's a storm, snow drifts up to a foot around the iglu. The weight may make the ice crack, water seeps up and you can't get your equipment out. When the ice is thick enough, though, it's warmer to have your iglu on the lake rather than on the land.

"Now, about the temperature inside an iglu. If it's too warm, you're going to make a hole through the wall or ceiling pretty quick or you'll widen your ventilation hole and the iglu won't last long. If the heat melts the snow from the inside, you'll get a layer of ice inside—that make it colder not warm. After you live in the iglu for a week or so, the top gets thinner. So you cut the top half off and make another top!"

Tongola Sandy cutting ice blocks; Photo credit: Marilyn Walker

Tongola wears a parka, pants, and *kamiks* (boots) all made of sealskin by his wife Rosemary. "Seal is the best for iglu building," he tells me. "But caribou is much warmer than seal. You have to take your caribou clothing off before you skin an animal or you'll get too hot! Caribou skin clothing will make you float if you fall in the water because the hairs are hollow. Before you enter the iglu, you have to use *anaotark* (snow beater) to beat the snow off your clothing. We leave our outer clothes outside. We don't want them to melt inside or they ice up (and lose their insulative properties). You could bring them into a cabin, where it's warm, but for an iglu, you put them in a hollow you make—a ledge in the entrance area where you took the snowblocks from.

"In fall, when there's not enough snow for an iglu, you use a tent with a camp stove. Then as soon as there's enough snow, you build an iglu. If snow is hard to find, even if it's only six inches thick, you can cut the blocks out horizontally instead of vertically. At the end of March, beginning of April, it's hard to make the top part, so we build halfway up and use a tarp on top—this is still warmer than a tent. For a window, you can use any ice, but try to get clear

ice. Clear the snow off and with a chisel, you chip into it and try to undercut it to get it to crack at the bottom, then thin it off after it's cracked so you can lift it off.

"Men by themselves won't make a window for one night. But if you take your family out you would. At the top and to the side, you make a ventilation hole. Try to keep the hole small, otherwise air coming in will make it bigger and open up other holes. We try to keep the door closed too. When there's too much air, it makes a lot of holes out of little ones you can't see. They start and then get bigger and bigger. . . ."

The Central Asian Yurt

The domed or sometimes conical yurt or *ger* is the classic dwelling of Siberian and Mongolian nomadic herders. Like the snowhouse, its shape provides minimum exposed surface and maximum stability. And like the snowhouse, it is adapted to a migratory lifestyle as people move seasonally to forage their animals. The interdependence of herders and their animals is difficult for outsiders to understand. Galsan Tschinag, a Mongolian shaman of Tuvan ancestry, has written about it in his novel, *Blue Sky*.[13] (The sky in the shamanist tradition is the resting place of the spirits and is master of all things in the universe.) And the children's drawings and stories from Hovsgol Lake region illustrate how animals are almost family members. During a storm, they are taken inside the yurt if they are ill or nursing.

The frame is a collapsible lattice-like structure made of wooden slats that folds up for easy transport. The covering of wool, felted from their herd animals (sheep, goat, yak, camel, or horse) is laid over the frame as the roof and walls. The same structure is used year round, with the felt acting as effective insulation to keep the heat in during the cold months and as shade from the hot sun in the summer months. On hot summer days, or for ventilation, the felt is rolled from ground level up; the walls are tied and the door is left open. For cold summer nights after the sun has set, it is easily rolled back down. (Wool retains its insulative properties even when wet.) The open interior allows for multi-use.

The circular design of the yurt is important structurally and also energetically or spiritually. Six spokes meet at the center circle of the roof, like a cartwheel. The center circle is supported by two slender posts, which fix into sockets and extend to be supported by the lattice around the exterior yurt wall. The design thus

13
Galsan Tschinag, *The Blue Sky* (British Columbia, 2006).

represents the sacred nexus of spiritual energy. The stove, sometimes with an attached chimney, is located between the roof posts at the center of the interior so that the smoke escapes between the spokes of the sacred circle above. The ceiling hole can be covered or opened from inside by means of a long pole. The ingenuity of this framework allows it to be set up or taken down within half an hour.

Fenced-in ger, Ulaanbaatar, Mongolia, 2007; Photo credit: Marilyn Walker

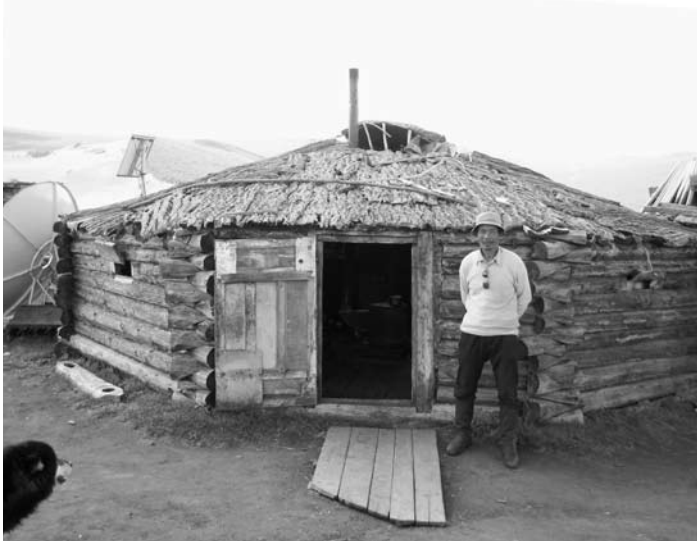
Sacred plants, such as juniper or cedar, are burned on the stove top. The smoke travels upwards, connecting people in this world with their ancestors in the spirit world, who are asked for protection and guidance. The opening is thus a portal into the unseen world of spirits and ancestors; it invites, locates, and integrates the essential forces of the universe. The Mongolian writer Purev describes how the fire is sacred and how it continues to be honored as the cosmogony out of which humans were born:

> Dorje Banzarov wrote that in ancient times, Heaven and Earth were a single entity. As a result of their separation, fire was created. Heaven became a masculine force that animated life, while earth was a female force that gave all things their form. Therefore, the Mongols called them 'Heaven-Father' and 'Earth-Mother' respectively.[14]

14
Purev Otgony and Purvee Gurbadaryn, *Mongolian Shamanism* (Ulaanbaatar, 2005).

Purev also writes that the roof ring flap is the most sacred part of the yurt and that it must be rectangular. Since I began researching sacred geometry in indigenous cultures, I am interested in finding out whether the rectangle is in the proportions of the golden mean.

The hearth separates the women's place from the men's, and family from visitor. As a visitor, it is extremely disrespectful to sit with your feet pointing toward the sacred space at the rear of the yurt or to cross in front of it behind the stove. Buddhism has become the official religion of Mongolia now, and it can be accommodated in the traditional layout as shamanism has been. The Buddhist altar, on which are placed photographs of deceased family members or wrapped candies offered to the spirits, is located at the back of the yurt across from the entrance. Thus the yurt offers visual instruction about spiritual truths and actualizes metaphysical insight into physical form. It also acts as a symbolic model of the cosmos. The yurt acts as a sort of blueprint for the ecological, aesthetic, social, and cosmological relations that are both shaped by and reflected in the built environment. When people move into prefabricated houses, these relationships are reconfigured or they may not make the transition.



Ovvner in front of log ger with satellite dish, Darhad Valley, Mongolia, 2006; Photo credit: Marilyn Walker

The center circle serves as a focal point for shamanic ritual, underscoring how the ritual space has coevolved with the use of the yurt shape as shelter. I was told of some shamans who made use of the acoustics of the yurt in their *khamlanie* (shamanic ritual). Standing at the center, a skilled drummer/singer is said to

be able to direct the drum beats or vocalizations to deflect off the yurt walls and onto a particular part of the body of a participant in need of a powerful impact. Also, as the originator of the sound, the shaman's energy or power would be enhanced as the walls of the yurt reflect and amplify the energy back to the originator.

It is speculative but interesting as to whether this shamanic use of the interior is consistent with a western scientific understanding of the structural properties of the yurt. A parabola, in a technical sense a mathematical expression of a particular geometry, is a variation on the circle, which exists on a two-dimensional plane. Simply put, a parabola is a circle that has been warped. Thus it is elemental in the same way that a circle or a square is iconic. An orthographic view of a yurt reveals it to be a circle with no corners where energies might intersect and where all energies are continuous around the edge. A parabola retains the structural simplicity of a circle, but in 3-D form. If one puts a force into the center of a circle, it distributes the force equally to all points on the exterior and vice versa (and these centrifugal and centripetal forces may intersect). A sound or pulse from a drum, rattle, or voice originating at the center of the circle may distribute the force equally to all points on the exterior of the circle, or be manipulated by the movements of the shaman's dance. From an ethnographic perspective, it suggests that the ritual use of the yurt grew from, or coevolved with, its use as shelter. It also points to the yurt as an elemental form modeled on universal principles.

The Dukha Tipi-style Ger

The reindeer-herders of northern Mongolia are Tuvan by ancestry, which makes them a minority among ethnic Mongolians. They are also reindeer-herders who forage their animals in the higher reaches of the mountains. Known to outsiders as *Tsaatan*, the Russian word for "reindeer-herder," they call themselves *Dukha* or *Tuvan* to indicate their connection with their relatives across the Mongolian-Russian border on the north slope of the Altai Sayin Mountains. And they are still shamanists and minimally influenced by Buddhism. Despite years of attempts by the Soviets to weaken their identity, break up their communities, sever their connection to place, and disempower their shamans (and while most of the Dukha now live a more settled life in the town center of Tsagaan Nuur), some households continue to live year-round with their reindeer on the taiga.

Their tipi-style homes, called, interestingly, *orts*, are easily put up and taken down as the reindeer and their herders move

camp seasonally. Today they use canvas instead of hides as the covering. Most families power a radio and overhead light bulb with solar panels purchased from China, and for a special occasion, a borrowed satellite dish and television will allow everyone to get together to watch, say, the soccer finals on Italian television. But, generally, the organization of social relations within and among the *orts* follows tradition when they are "on the taiga."

Ger camp, student's drawing, Darhad Valley Mongolia; Credit: BioRegions International, Arts and Artisans Program

Dukha nomadism, their language, medicine, camps, living arrangements, and the layout of their homes—their entire way of life—has developed over millennia and in a particular landscape, the taiga. *Taiga* is used in Russian and now in English to mean the boreal forest that extends in a wide band across the Northern Hemisphere. The Dukha, however, use it to mean the mountain-tundra plateau found above the alpine treeline of the Altai Sayin. This is because they distinguish among the forest, the mountains, and the mountain-tundra or taiga, actually a term indigenous to several Siberian languages, including Tuvan. The taiga is rich in *shulum*, or "reindeer moss," which is a lichen and the reindeer's favored food. As the weather warms, the reindeer-herders move higher and higher up the mountain—the reindeer need colder temperatures to remain healthy.

Their perception of "ecology" is different from outsiders in other ways. Not human-centric, it recognizes the interdependence on the material and metaphysical levels between humans and nature. It implies a balance or harmony among the plants, animals, the land—all of which have a life force, a sentience. "Ecology" is

about the seen or physical world, as is implied in the English term, but for shamanists, it also encompasses the unseen world of spirits. This world includes the spirits of their ancestors, with whom connections must be maintained to keep the worlds in balance. All Dukha have individual helping spirits which must be treated with respect and which in return take care of them and the land on which they depend. Some have very strong helping spirits and the shaman's gift of accessing the assistance and guidance of the spirit world on behalf of their community.

This cosmology determines the layout of the *orts* and how social relations are structured. I am served reindeer milk yogurt, which I accept in my right hand in the customary way. As a guest, I am seated on the left side of the tent while the family sits on the right or east side—the entrance of their homes always faces south so that as you leave, you can give thanks to the sun as the primordial life source. In Central Asian style, the stove is placed in the center. The hearth, again, is a sacred place at the center of the circle. I was told never to be disrespectful by tossing garbage—bits of paper or candy wrappers—into the fire.

At the back of the *orts*, in the sacred place opposite the entrance, hang the spirit bags. These are made by a shaman for each person in the household as protection from sickness and other "bad things," and to bring happiness. For the real shamanic people, I was told, you are not even allowed to walk past or sit on the north side of a shaman's home in front of a spirit bag. During the lunar New Year, offerings of food and tea are made to the spirit bag. On migrations, the spirit bag will be packed carefully on the designated spirit reindeer at the front of the line to keep them all—humans and reindeer—safe and well.

Contemporary Circumpolar Architecture

While there is considerable literature on Arctic structures, the principles of indigenous design and their ecologies have not been easily integrated into the "white man's" approach. Still today, there is reluctance, perhaps based on misunderstanding or hegemony or just on unfamiliarity with the limitations of the Northern environment, to take these principles seriously. We have not shown an understanding of the impact of a newly sedentary lifestyle on social and cosmological relations when people were moved from structures that are concentric in their orientation to angular, square, or rectangular frame houses designed by outsiders.

The potential remains for architects, engineers, administrators, and planners to learn from the shelter strategies, aes-

thetics, and spirituality of Indigenous Peoples of the circumpolar regions. These have been shown to be successfully adaptive throughout prehistory and before and after contact. They could now be incorporated into urban planning. In Igloolik, for example, I met a woman who kept a snowhouse outside her government-issued frame home because the temperature was not "too warm." Here, she found it easier to work the hides that she made for clothing to use "on the land." And she enjoyed the feeling of being in a snowhouse—the muffled sounds of the outside world and its luminosity. In Ulaanbaatar, the capital of Mongolia, yurt camps have sprung up all over the city; the construction of affordable apartments and houses has not been able to keep pace with the expanding migrant population. Anyway, many people prefer the *ger* lifestyle, even in town. The Mongolian children's drawings especially confirm that although accommodations need to be made for water, sewage, power, and other services, the principles of contemporary indigenous architecture are valid, sustainable, and economical in the modern context.

The built environment of the circumpolar world is consistent across its extent in that it addresses severe environmental conditions. Its strategies have also been localized to make use of the resources, technology, and innovations at hand. Even today, there are times when local materials are more practical or available than southern imports. Indigenous lifeways are still innovative, dynamic, and adaptive. These same skills and abilities are relevant to issues faced by circumpolar peoples today in their shelter forms as living traditions. We need to focus on the mediations being made by circumpolar people as they navigate back and forth between the traditional and the modern and involve them in shaping their built environment. The skills and ingenuity that inspired traditional circumpolar architecture have not yet been lost. They can continue to inform and inspire if circumpolar peoples are included among the experts that design their homes and communities.

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Mobile Houses

Buckminster Fuller's Concept of a Dynamic Architecture

Carsten Krohn

Buildings are usually conceived as solid structures built on foundations that are firmly rooted in the ground. It is this immobility that distinguishes buildings from furniture. But, paradoxically, in the last century many attempts were made to overcome the immobility of architecture, with the promotion of an architecture of increased dynamics—it was even predicted that mobile houses may determine the future of housing in general. These ideas have been permanently dismissed as utopian, but despite this dismissal, architects have continued to investigate the possibilities offered by mobile architecture as alternative ways to house people.

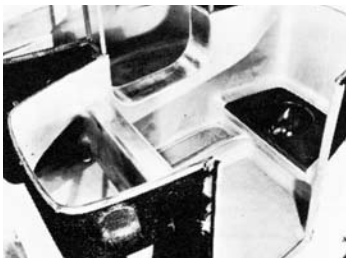
Why should buildings be mobile at all, moving from one place to another? Pragmatically mobile architecture has been developed for military purposes and for scientific research in remote areas such as the polar regions. Conversely to this pragmatism, mobile architecture also holds within it a strongly idealistic model of society. It was expected that the ultra-light buildings, which could be carried like snails' shells by anyone, would overcome not only conventional architecture but also change the corresponding social order, which was seen as rigid.

In the twentieth century, traveling became more widely available to a larger sector of society and increased in an unprecedented way. This progression of transport technologies seemed to influence the development of a similarly flexible type of architecture that treated buildings in the same way as cars and airplanes.
The American architect Richard Buckminster Fuller (1895–1983) was the strongest proponent of mobile architecture. Unlike architects who create buildings as individual works, he focused on the design of prototypes. He conceived the mobile house as a mass-producible industrial product that was intended to revolutionize housing. Fuller was not trained as an architect, but despite this, after struggling to promote his vision, he was able to garner a large amount of support as he traveled the country giving lectures and talks. His importance in architectural history is mainly based on the effect he had on others.

The House as a Machine for Living

Buckminster Fuller adopted the expression "machine for living" from Le Corbusier, who had coined it in relation to residential buildings. At the end of the First World War the French aircraft manufacturer Voisin, which had produced over 10,000 airplanes for the military, began developing prefabricated houses in order to compensate for a sudden loss of wartime contracts. This project was unpopular with conventional building contractors, who successfully lobbied against it. Le Corbusier, however, was fascinated by the

enterprise to such an extent that he promoted it in his magazine *L'Esprit Nouveau.* He illustrated his article with a picture of one of the houses on a car trailer. Although at that time Le Corbusier himself only received commissions for individual villas, he designed and published minimalist house types that would be suited for serial production.



Figs. 1a–c: Richard Buckminster Fuller: Dymaxion Bathroom, 1937. Source: Robert W. Marks, *The Dymaxion World of Buckminster Fuller* (Carbondale, 1969), pp. 90–91.

Fuller, like many other architects of the time, believed that technological progress would lead to completely new buildings. Therefore Fuller oriented his design toward that of vehicles. This fascination with the shapes of ships, planes, and cars was not limited to Fuller. Le Corbusier and Walter Gropius had designed cars, but it was Fuller who was able to produce a car prototype according to his design in the early nineteen-thirties. Though it was never put into mass production, many of his experiences here were channeled into his project for a "machine for living."

The first sketches of the project showed an extremely light construction, suspended from a central mast, which could be easily transported from one location to another by airship. A comic-like presentation depicted first the airship dropping bombs and then the houses being placed in the craters made by the bombs. On a world map the Sahara, the Amazon, Alaska, Siberia, Greenland, and the North Pole were marked as potential locations for these buildings. Although the project at that time appeared to be unrealistic, Fuller was obsessed with proving its feasibility.

Fuller had stated from the outset that the complex development process would be costly. In 1937, ten years after Fuller had

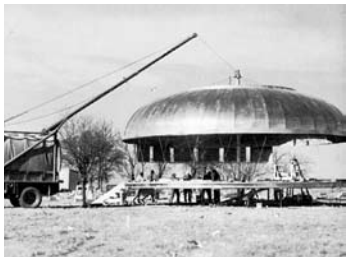
begun to develop a mass-producible house and had exhibited a model of an early version, he presented the first building element to scale, a compact monolithic bathroom unit resembling the toilet cubicles of today's aircrafts (figs. 1a–c). As with all of his projects the design was determined by a consistent minimization of materials. Throughout his life Fuller tried to articulate a theoretical basis for this concept that focused on achieving the most efficient use of resources.

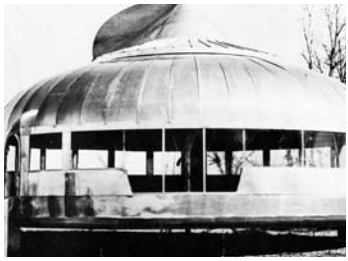
The compact bathroom unit was composed of four parts and could be installed quickly and with ease. The lower elements were made of copper sheet and coated on the inside with a non-corrosive alloy of tin and silver, while the upper elements consisted of an aluminum sheet that was coated on the inside with a colored resin. A step to the tub was lined with cork, asbestos was sprayed on the outside to soundproof the space and prevent a drum effect. The unit was fully equipped with heating, ventilation, and lighting, and was supposed to be plugged in like a washing machine. Fuller saw a lucrative business opportunity in the equipping of old buildings with his bathroom unit, and was able to convince a copper company to produce a series of prototypes. For future versions of the unit he envisaged plastic as the ideal material. However, the entire project was halted after successful lobbying by the plumbers association.

Figs. 2a–c: Richard Buckminster Fuller: Dymaxion Deployment Unit, 1940. Source: Marks 1969, pp. 116–18.

Fuller was looking for new industrial partners, and as a result in 1940 he presented the first completely demountable building (figs. 2a–c). Unlike its predecessor, it was no longer hexagonal but

circular. The central mast on which it was suspended was retained, but now only for assembly, which took place from the top down. This extremely simple construction of self-supporting corrugated iron not only resembled grain silos, but was developed in cooperation with a manufacturer of such silos. The unit was insulated with glass fibers covered by a layer of plastic sheets; the porthole-like windows were made of acrylic from aircraft windows. A special ventilation system was introduced to make the building suitable for use in extreme climates. The units could be interconnected and were intended for military use, as radar stations, barracks, or hospitals. In fact, the units were deployed in Saudi Arabia and one of them was even set up in the sculpture garden of the Museum of Modern Art in New York.





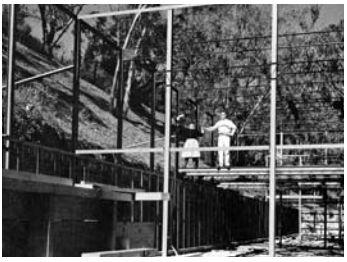
Figs. 3a–c: Richard Buckminster Fuller: Dymaxion Dwelling Machine, 1946. Source: 3a,b: Marks 1969, p. 128; 3c: John McHale, *R. Buckminster Fuller* (Ravensburg, 1964), Ill. 25.

Fuller strove for continuous modernization and criticized architects who did not. He was convinced that a new industry based on permanent optimization of the building process would improve the world. In his research he collaborated with defense contractors, although he declared it his goal to help ensure that arms would become unnecessary. Due to his enthusiasm and experience of previous implementations he was able to convince the Beech aircraft factory in Kansas to produce a house made of aluminum, steel, and Plexiglas (figs. 3a–c). In 1945 a first prototype of this mass-producible house was set up.

The optimal shape of the hull and the crowning ventilation element was determined by experiments in a wind tunnel. Fuller believed that the house should not only be mobile and extremely

cheap, but also hurricane proof. The design had similarities with both an umbrella and a bicycle wheel, featuring tensile stressed spokes and a circular thrust collar. Significant weight savings were made through the suspended construction. The work represents a synthesis of Fuller's concepts, including integrated wardrobes, a paternoster-like electronically controllable shelf system, and the previously developed bathroom unit. The house was transportable as a complete assembly kit, had excellent acoustics, and was easy to clean. Due to the failure to find any investor, however, the planned production of a thousand pieces per day was not reached.

Fuller's machine for living had an enormous effect on the architecture profession, which he generally accused of only being interested in the appearance of buildings. Those architects who referred to him—such as Konrad Wachsmann and Charles Eames—were themselves fundamentally redefining their practice. Wachsmann subscribed to the idea of a mobile architecture as his life's work, while Eames gave up building because, like an artist, he wanted to make no compromises. Together with his wife, Ray, he designed models for industrial production. The Eames, like Fuller, were active in many fields, they designed furniture, interiors, exhibitions, and made films. Working with Fuller on several joint projects, they strove for a similar optimization of materials.



Figs. 4a–c: Charles and Ray Eames: Case Study House 8, 1949. Source: 4a, b: John Neuhart, Marilyn Neuhart, Ray Eames, *Eames Design* (New York, 1989), pp. 108–09; 4c: James Steele, *Eames House* (London, 2002), p. 30.

The house that the Eames built for themselves in 1949 in Southern California was delivered as a kit and could be assembled in a short time (figs. 4a–c). The delay of delivery of the kit enabled them to get to know their building site in detail, with its panoramic

views over the Pacific and a mature tree population, and resulted in them revising their initial draft. The light steel structure was flexible enough to be assembled in a modified form.

Unlike most architects, the Eames did not draw or sketch; instead they experimented with three-dimensional forms. They often rebuilt the interior of their house and arranged it with furniture designed by them, as well as with numerous other decorative objects. In their film presentation of the house they showed photographs of details and interior views, of flowers, rocks, carpets, pillows, bowls, shells, figurines, and indoor plants as if they wanted to demonstrate that ideally the architecture would be invisible.

The long, narrow floor plan of the Eames' house was organized in a similar way to the residential units in the Unité d'habitation, which Le Corbusier had designed with Jean Prouvé and Charlotte Perriand at the same time. In both cases, a two-storey living room is combined with an open gallery designed as a bedroom. Le Corbusier proposed a stacking of these units and illustrated this principle with an image of bottles lying in a wine rack. The structural independence of the residential units from the parent structure later inspired the concept of megastructures with interchangeable residential capsules, which transferred the idea of mobile architecture to the urban scale.

Geodesic Domes

During his investigation into a reduction of material use, Buckminster Fuller focused on exploring fundamental construction principles. As a teacher at Black Mountain College, a progressive art school that was influential for many American avant-garde movements, he worked intensively with mathematics, physics, and chemistry, and developed the geodesic domes (figs. 5a–c). He recognized the geometric principle of the separation of a spherical surface into triangular elements and developed and patented a construction system composed solely of rods and joints. With this system, a maximum amount of space could be spanned at a minimum construction weight.

For Fuller, this design principle, based on geodesic lines, i.e., lines that connect two points on a sphere by the shortest route, was analogous to the way nature resembled constructions in molecular and atomic scales. He announced that he had discovered nature's construction principles and claimed that geodesic domes were characterized by the lack of a personal design language. Fuller was convinced that this universal principle applied irrespective of scale. He believed that such designs were feasible in any size, and that

increasing their size would result in relatively lighter structures. The potential to span enormous spaces with geodesic domes was demonstrated with a photo montage of a dome covering Manhattan.

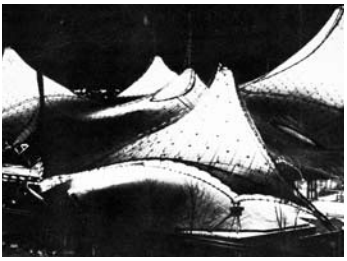
Figs. 5a–c: Richard Buckminster Fuller: Geodesic Dome, 1959.
Source: Joachim Krausse, Claude Lichtenstein, eds., *Your Private Sky—R. Buckminster Fuller* (Zurich, 1999), pp. 372–73.

The Wall as a Membrane

When Fuller declared that technically the whole earth could be covered by a dome, it was the architect Frei Otto, a specialist in tent structures, who pointed out the limits of span constructions. Otto adored Fuller and recognized parallels in his own way of working, yet the mystical dimension of Fuller's work remained alien to him. When Otto designed the roof for the German Pavilion at the World Expo in Montreal in 1967 (figs. 6a–c), concepts of mobility were emerging as an important theme in architectural discourse. At the same World Expo, Fuller was able to demonstrate the practicality of his ideas with a giant geodesic dome for the U.S. Pavilion.

Otto's tent structure for Montreal suggests a simple assembly and disassembly, but the design process was complex. Due to this complexity the final form was determined through a series of experiments with models, using both liquid-soap and wind tunnel tests. Since the technique had not been applied before, a new measuring instrument had to be developed. The tensile steel cable-net construction, which was realized in Montreal, was covered with coated canvas on the exterior and had a layer of polyester on the inside.

Otto, like Fuller, had also made plans to cover an entire city with a dome structure. Together with the Japanese architect

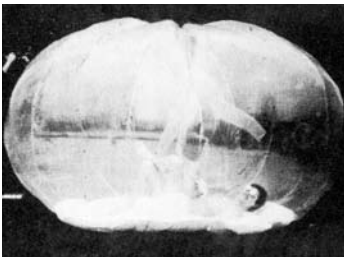


Figs. 6a–c: Frei Otto and Rolf Gutbrod: German Pavillion Montreal, 1967. Source: Ludwig Glaeser, *The Work of Frei Otto and his Teams 1955–1976* (New York, 1971), pp. 26–27.

Kenzo Tange, and sponsored by a fabric manufacturer, he designed a new town in the Arctic. Covered by a transparent membrane with a diameter of about two kilometers, the city could accommodate between 15,000 and 45,000 people in a controlled climate. The dome would consist of a double skin transparent foil with a low profile to resist storms and prevent the accumulation of snow. It was devised as a pneumatic construction that would stabilize itself through air pressure; a positive pressure in the interior would support the cable-net dome. The design included sunscreens on the south side, as well as an artificial sun that moved along a suspended rail, in order to simulate daylight during the long Arctic winters. It was finally Buckminster Fuller who designed a low geodesic dome for the United States national research station at the South Pole. Although on a smaller scale than Tange's project, it acts as a climate-envelope, covering an array of container buildings.

While the rapid development of technology in the nineteen-sixties was reflected in architecture, culminating in futuristic urban visions, a general skepticism about megastructures emerged. This transition from utopianism to skepticism can be traced through the work of the British architectural group Archigram and the Japanese Metabolist group. Although Archigram never realized any buildings, they made an impact on architectural discourse through their drawings and designs. Like Fuller, whose concepts had influenced them, they declared that their work was apolitical. However, the way in which they handled Fuller's concepts did not entirely follow his intentions. Fuller's portable bathroom unit inspired the architects of Archigram to devise the Plug-in City, a giant

structure of mobile residential capsules. Ironically, Fuller's radical ecological approach toward resource saving served here as a model for a consumerist "throwaway architecture."



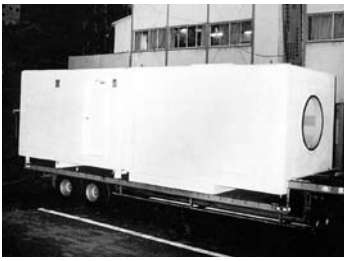
Figs. 7a–c: David Greene (Archigram): Cushicle, 1968. Source: Peter Cook, Warren Chalk, Dennis Crompton, David Greene, *Archigram* (Basel, 1991), p. 82.

In a performance in 1968, Archigram presented the "cushicle," an inflatable domestic space (figs. 7a–c). The performance, like their drawings and colorful montages, was intended to transform radical concepts into evocative images. Archigram's gesture speculated about the impending end of architecture, and a return to a state of nomadism, in the same way that the avant-garde architects of modernism had predicted that the city's future would be its dissolution.

Figs. 8a–c: Norman Foster: Air Supported Office, Hertfordshire, 1970. Source: Ian Lambot, ed., *Norman Foster Buildings and Projects 1964–1973* (London, 1991), pp. 125–26.

Norman Foster's inflatable office project of 1969 (figs. 8a–c) arose from a different spirit; from a pragmatic attitude. A rapidly expanding company required space for seventy employees, so Foster proposed a tent structure that could be built in less than an hour. The building soon experienced complications due to climatic extremes; summer heat was a particular problem. At a time when technological climate regulation was a new field for engineers and architects, all there was to regulate heat overload were lawn sprinklers spraying on the tent from the outside.

The experimental office unit was only intended to be in use for a year, however it triggered Fuller's interest. For a while Foster and Fuller, who used similar technological approaches to design, worked closely together. In fact, they designed several buildings together, including a geodesic house, one for Foster and an identical one for Fuller. Foster's method of designing variants for every detail in order to achieve a process of continuous improvement is comparable to the development of an industrial product.



Figs. 9a–c: Kisho Kurokawa: Nakagin Capsule Tower, Tokyo, 1971. Source: Alain Guiheux, *Kisho Kurokawa—Le Métabolisme 1960–1975* (Paris, 1997), pp. 50–51.

In the nineteen-sixties an avant-garde architectural group formed in Japan, calling themselves Metabolists. The term was chosen because of its reference to the metabolic system, with its conversion and exchange processes. They had similar ideas as Archigram about megastructures, however they would not be satisfied by only producing images. Kisho Kurokawa, one of their members, realized the Capsule Tower in Tokyo in 1971 (figs. 9a–c), which consists of identical one-person houses. He reduced the home to the bare essentials, but it still remained comfortable. Although the Cap-

sule Tower is not mobile per se, it expresses mobility, reflecting the hopes and aspirations of its time. Despite the building being registered as a monument, a decision was made in 2007 to demolish it.

More than three decades after Buckminster Fuller presented the portable bathroom unit, the Metabolists revisited his concepts of mobile architecture in a very different cultural context. In retrospect this revision seems symptomatic of the development of twentieth-century architectural practices. Manifestos and theories that may have been criticized sharply reappeared at other times and in other locations, gaining new relevance. The development of architecture has not been linear.

In light of the current environmental challenges, another revision of architectural concepts seems necessary. Foreseeable climate changes will shift the global distribution of wealth. Droughts, floods, and other "natural" disasters have already increased the proportion of the world's population that is forced to migrate in order to survive. The refugee camp has become today's negative implementation of the once liberating project of mobile architecture. The idea of mobility was developed as a utopian project from Buckminster Fuller's initial developments to the megastructural designs of the Metabolists. In order to regain these original utopian claims, the paradox of developing a mobile architecture has to be investigated once again.

Ralph Erskine, Colonist?

Notes toward an Alternative History of Arctic Architecture

Jérémie Michael McGowan

In this paper I focus on Ralph Erskine's enduring image in architectural discourse as the "Arctic Architect" of modernism. My interest here lies specifically with the way architectural writings on Erskine seem to inhabit a separate time and place from the history of postwar Arctic colonization to which Erskine's work in circumpolar Europe and North America are, I argue, inextricably bound. Taking the cover image appearing on the Erskine monograph, published by *Architectural Design* in 1977 as my reference point, I trace out Erskine's rise to prominence as the "Arctic Architect" of modernism during the previous two decades. A summary of the *Architectural Design Profile*, together with a brief overview of the writings on Erskine that followed, reveals a homogeneous contemporary understanding of Erskine as "a hero for our time."[1] Linking Erskine's work to problematic events in the Arctic during the nineteen-fifties, sixties, and seventies, I question the validity of Erskine's well established "hero status" in architectural discourse today. Isolating the term *indigenous* as it appears in Erskine's writings throughout the postwar period, I suggest ways in which we might begin rethinking Erskine's Arctic legacy.

In 1977, *Architectural Design*, a journal already renowned internationally for its groundbreaking coverage and contemporary critique of current architectural theory and practice, began publishing profiles focused on a particular architect, theme, or project. That year's volume, forty-seven, comprises nine inaugural profiles on the work of Arata Isozaki, Charles Moore, OMA, and others, capping off an impressive twelve-month run of the newly launched publishing format with a double November–December issue on Ralph Erskine. Bold red lettering and an intense blue background frame a fantastic cover image of snow, ice, and vibrant primary colors, setting the stage for *Architectural Design*'s comprehensive presentation of Erskine, "Sweden's foremost popular architect."[2] The drawing used as the cover image, produced by Erskine in 1973 as part of his then ongoing work for a "new town in the Arctic wastes of northern Canada," seems fitting for the time of year: it is wintry, festive, and a touch magical.[3] Poised inconclusively between childlike naivety and professional genius, Erskine's playful image entices us to enter into the strangely captivating winter wonderland it presents. This is a place that for many viewers—then, as now—would have been intensely alien to behold. Welcome to Resolute Bay, Nunavut, a thriving modernist utopia (if we believe Erskine's image) on the fringes of civilization as we know it.[4]

The cover of the 1977 *Architectural Design Profile* shows a cluster of one- and two-story, brightly colored buildings encircled by an orange, red, and yellow, multistoried perimeter wall; this is inhabited, fenestrated internally, and clad externally in blue and green vertical paneling. Small figures populate the streets of this horseshoe-

shaped town, which opens onto a readymade ice rink where a handful of figures skate and play hockey. Further into the foreground we find a blue, semicircular outbuilding—its roof sprouting solar panels, radar equipment, satellite dishes, and telecommunication aerials—prominent features atop the town's undulating perimeter wall, and also the tallest of the three craggy cliffs in the background. Above this white mountainous landscape, a spiky yellow-orange sun, helicopter, hot air balloon, and flock of birds drift effortlessly through a cloudless, blue-green sky. In icy water of the same pale blue-green color, a large yellow-and-black oil vessel anchors peacefully among icebergs and shore ice rendered in a seductively inscriptive manner, from which Erskine's signature seamlessly emerges. Traveling from here along the jaggedly arcing coastline that cuts through the foreground of this joyous scene, we end up among a final grouping of figures, a few sleighs, and two whales—a collection of loosely inked lines and markings that almost escape our attention.

This image, perhaps more so than any other, captures the essence of Ralph Erskine's widely celebrated approach to building in the Far North. It vividly brings to life the poetic vision of an architecture completely at home in the Arctic, which Erskine had so captivatingly presented about nine years earlier in a 1968 article for *The Polar Record:* "Here houses and towns should open like flowers to the sun of spring and summer but, also like flowers, turn their backs on the shadows and the cold northern winds, offering sun-warmth and wind-protection to their terraces, gardens and streets."[5] This vision of an Arctic "sunflower town," developed already in the mid-nineteen-fifties, is something Erskine would cling to for the rest of his career. A late interview with Ken Tadashi Oshima for A+U in 2005, for example—the year of Erskine's death—presents us with an Erskine speaking as passionately and confidently as ever about his poetic approach to architecture in the North:

> When considering the problem of building in the north, to talk of an architecture of climate would be to tell only half the story. It is people in the climate, the cities and the landscape . . . that count. Ordinary people, not architects, people who are born in the north and know it and love it. . . . I try to base my work on that rhythm of seasons and life in the north, which I find so enthralling, and form communities which encompass all its richness of contrasting experiences.[6]

The problem here, which I will return to in conclusion, is that Erskine's focus on "ordinary people" is not, perhaps, as straightforward as we imagine. If talking about people is—as Erskine claims—

at least one half of the story here, then what of the people pictured in the bottom left corner of the *Architectural Design* cover image? Who might they be, and what do they have to tell us about Erskine's architectural legacy in the Arctic?

Working primarily in Sweden since the end of World War II, Erskine developed a reputation for his uniquely Northern brand of participant-centered architecture throughout the nineteen-fifties, sixties, and seventies, with his speculative work in the Arctic—while often unrealized, or only partially finished—ultimately captivating architectural imaginations. Almost twenty years before the publication of *Architectural Design*'s 1977 profile, in which Mats Egelius would first coin the catchy moniker "Arctic Architect," Erskine had already staked quite a claim to that enduring nickname.[7] Arriving at CIAM's 1959 congress in Otterlo as a relative unknown from way "up there" in Sweden, Erskine delivered an engaging and esoteric polemic on building in the Arctic.[8] His enigmatic, functionalist-driven manifesto, then titled "The Sub-Arctic Habitat," left its mark in Otterlo, with Erskine receiving instant acclaim from Europe's architectural elite.[9] Backed up throughout by a range of naïve drawings, illustrations of his practice's recent work in Sweden and a host of geographical, climatic, and environmental data, Erskine's "grammar for high latitudes" energetically covered twelve discrete issues, such as "the cold," "snow," and "isolation," related to building in the Arctic.[10] It firmly established him as modernism's predominant authority on everything to do with architecture and the North.

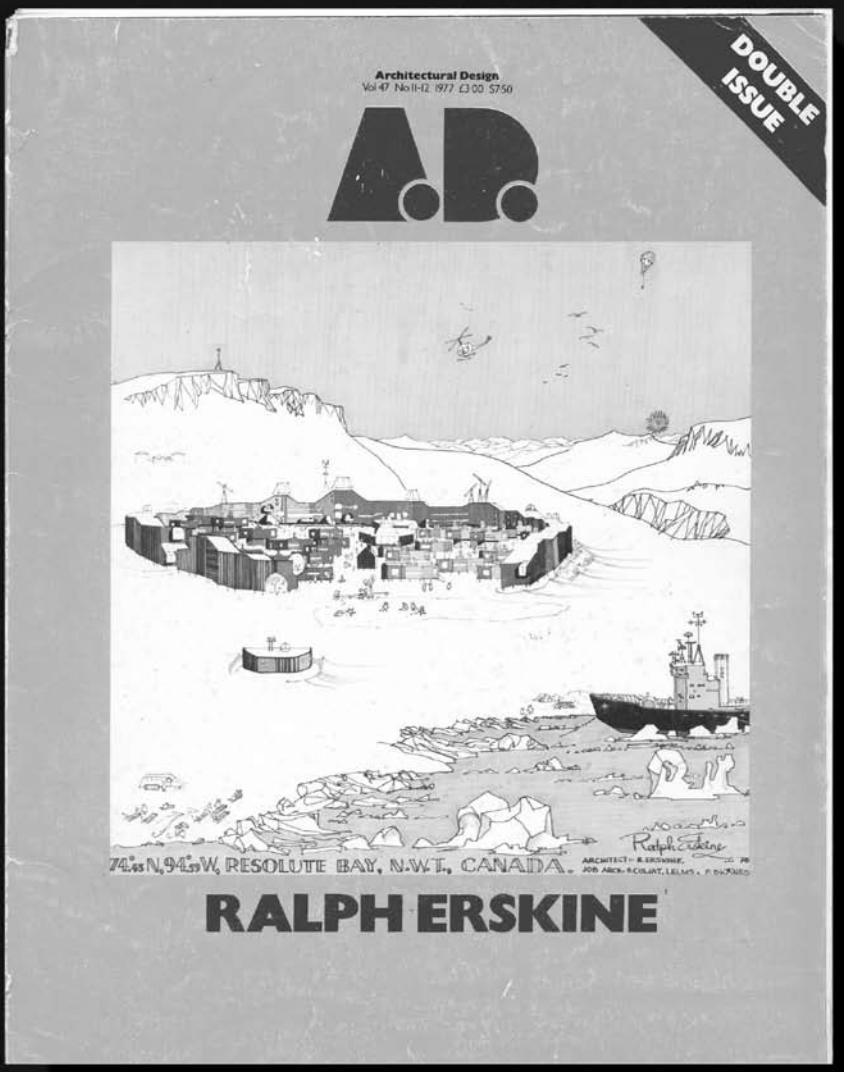
There was, however—as is still the case in the architectural discourse surrounding Erskine today—a degree of misleading language employed. Erskine plainly sensationalizes the North for his 1959 audience in Otterlo, drawing on longstanding tropes of the Arctic to mesmerize his southern listeners. In so doing, he succeeds in positioning himself, through a strategic use of casual, anecdotal language, as a bona fide "native" of the North—a person ideally, if not uniquely, suited to address the difficult question of how best to build in the Arctic:

> At the same time, there is the problem of the sun that goes on the whole damn day and night in the middle of the summer. The Laps don't mind it, the Eskimos don't mind it, and the people who are born up in the north of Scandinavia don't mind it, but the people moving in cannot sleep at night. During the summer up there, one's life becomes thwarted. One has no idea what one is going to do. There are people wandering about in the middle of the night and eating meals. The whole tempo comes out of rhythm. It is something quite fantastic.[11]

Two further essays on architecture and the Arctic, published in *Architectural Design* (1960) and *Perspecta* (1963), continue the general thrust of the 1959 manifesto, noticeably playing out a similar—and similarly problematic—colonial logic.[12] Each describes the Arctic as an area previously "unknown to southerners" and "once inhabited only by Lapps, Eskimos and Indians."[13] Contrasting the Arctic of "Fifty years ago . . . [a place] outside the world's communication net,"[14] with the Arctic of the nineteen-sixties, Erskine's essays for *Architectural Design* and *Perspecta* go on to establish the northern circumpolar region as both a strategic military zone and an area rich in unexploited natural resources: "Below the tundra lie deposits of iron, nickel, copper, lead, gold, radium, asbestos and oil, whilst above it fly the new polar airways."[15] From here, Erskine moves on to what seems to have always been the real issue at hand for him—namely, how to establish and maintain the presence of "new settlers" in the Arctic regions: "Today it is growing rapidly in importance and attracting more and more settlers. They are moving from populous areas to small towns in an isolated land and must be given the amenities they previously enjoyed."[16] In these contexts, Erskine promotes his own work in Sweden as an appropriate paradigm to follow, rather cryptically using the term "Arctic indigenous" to describe his achievements to date. His 1963 text for *Perspecta*, a journal published by the Yale School of Architecture, is a prime example.

Titled "Indigenous Architecture," Erskine's *Perspecta* article is illustrated throughout by an unnamed, undated, and unlocated architectural project. Referring to this work—which is, in fact, the mid-nineteen-fifties "Villa at Lisön," a holiday home on an island in Stockholm's Baltic archipelago—as "my first fairly indigenous building" for the North, Erskine delivers a concise distillation of his entire Arctic building philosophy: "It is very much based on the seasonal rhythm of life in the north: the completely protected winter cell, the surrounding semiprotected spaces for spring and fall, and, beyond them, free summer life in a natural landscape."[17] Over the course of forty-odd years, little changes. Discussing his work in a 2005 issue of *A+U*, Erskine may as well have been quoting from his 1963 essay: "I shape my buildings with a completely protected winter part surrounded by separated sheltering outdoor places for spring and for autumn. Beyond these places is free summer life in the natural landscape with which the north is so richly endowed."[18] These are, of course, the primary features of the fantastic, almost childlike drawing featured on the cover of the 1977 *Architectural Design Profile*.

Comprised of a short introductory text by Charles Jencks and a lengthy monograph by Mats Egelius, the profile progressively



"Profile 9: Ralph Erskine," *Architectural Design* 11–12 (1977) cover page.

champions Erskine's work—regardless of the actual latitude of his projects, many of which are in and around Stockholm—as highly successful blueprints for building, at any scale, in the Arctic. With Egelius—himself a Swede—lending credibility to Erskine's work in the Arctic, Jencks provides the general background to Erskine's oeuvre, explaining that the key to all of Erskine's work is, ultimately, its deep-seated humanity:

> Erskine's primary humane quality then is his willingness to get involved in the lives, dreams and petty details, the minutiae, of his clients. He consults the people who will live in his architecture and responds to their local culture, even if he doesn't go all the way and adopt their customs and local language of architecture.[19]

Jencks's reading of Erskine's work opens on to what is, for me, the key problem here. Despite the clear focus on people, it seems certain populations mattered very little to Erskine—although we find no trace of this in the discourse currently surrounding him. Texts published on Erskine in the nineteen-eighties and early nineteen-nineties simply continue the project started by Egelius and Jencks in 1977. This is recognizable in the writings of Peter Collymore, Hugh Pearman, and Karin Winter, for example, who unanimously credit Erskine for inventing an "Indigenous Architecture" for the Arctic based sensitively on the region's unique climates, landscapes, and cultures.[20] They also, again like Jencks and Egelius, celebrate Erskine for his user-centered approach to design. And just as in the *Architectural Design* profile, it is often the Resolute Bay project that takes center stage on both accounts. As Collymore writes:

> Erskine considers participation with the eventual users of his buildings a vital part of the architects' service to the community. His architecture is based on two fundamental precepts: the buildings must be related to the climate and to the people who will inhabit and use them. . . . The new township at Resolute Bay in Arctic Canada, a town for Eskimos and white Canadians, is an obvious case where participation has proved essential.[21]

From Collymore, as from others, we get a glowing success story of a responsive type of architecture finely attuned to the needs, wishes, dreams, aspirations, desires, fears, and hopes of its end users. The problem, however, is that this understanding of Erskine's work is based on a number of potentially fateful omissions. A number of these are factual enough. The Resolute Bay project, for

example, does not really exist—at least not in the way it is typically presented to us at present. Coverage of the project in Denys Lasdun's *Architecture in an Age of Scepticism* gives us the impression that Erskine had, in consultation with "locals," established a thriving community in the far North. By way of illustrating his now long-running Arctic manifesto, this time as "Democratic Architecture," Erskine artfully describes three drawings (including a larger line-drawing version of the full color image used on the cover of the *Architectural Design Profile*) and one photograph of his Resolute Bay project as:

> An arctic community for 700 Eskimos and south Canadians incorporating many concepts of social planning and climatic design—only partially constructed. Southerners, and especially Eskimos, were involved in the whole of the planning process from the choice of site and form of the township to the placing, form and details of the buildings.[22]

The fact is that Erskine's project in Resolute Bay never really got off the ground; the cover image for *Architectural Design* remains, for the most part, pure fiction. Much the same goes for Erskine's work in circumpolar Sweden. His comprehensive plan for the "new town" of Svappavara is, in reality, only a fragment. While Egelius does acknowledge the ultimate failure of this Swedish experiment—which became embroiled in high profile miner strikes in 1970 before becoming abandoned altogether—the project nonetheless continues to circulate in architectural discourse as a key part of Erskine's infamous Arctic canon.[23] The mirage of the Architectural Design cover image persists, in other words, against mounting evidence to the contrary.

There remain more problematic cases of omission to follow, however. Most of Erskine's best-known projects in the Arctic chronologically intersect with a period of heightened "internal" colonization in circumpolar Europe and North America. It is in these contexts that Erskine's search for a new "indigenous" building typology appears genuinely problematic. From my point of view, the underlying logic of Erskine's "Arctic Architecture" seems to script the North as a carte blanche playground for modern architects—as if the native populations of the Arctic had vanished without a trace. Routinely minimizing, and then summarily dismissing, native solutions to building in the Arctic as unsuited "to the more complex needs of the . . . mineworkers, dambuilders and others who had come to develop the vast natural resources of the region,"[24] Erskine in turn champions a rather rampant colonial program: "Modern

man, like the Eskimo before him, must use his resources to arrive, by analysis and synthesis, at an indigenous culture."[25]

Here, Erkine's search for a contemporary architectural "grammar" for the Arctic overwrites the presence of Arctic indigenous peoples. Linking directly to the expansionist aims of European and North American governments in the postwar period, Erskine's understanding and use of the term *indigenous* ultimately seeks to establish Euro-American resource extractors as the new, "modern natives" of the North:

> In the sub-arctic zone there is an enormous quantity of space, but no established culture. . . . Up to fifty years ago this area was at the periphery of everything happening in the world. All culture and traffic-trade communications moved around the district without touching it. The natives led their own primitive life there. They had a culture of their own which, in isolation, was sufficient; it was not related to ours, or influenced through any contact with us. . . . It has become apparent that there is a need to find an indigenous culture and method of life—of modern life—in this untried region.[26]

Erskine's celebrated Borgafjäll mountain sports hotel of 1948, Luleå Shopping Center of 1955 and, of course, Svappavara Ideal Arctic Town of 1963 seem to be clear examples of this in the European context. Each project relates temporally to a period in Sámi-State struggles when governments of the Nordic countries typically defined "the anomalous social and economic status of indigenous peoples . . . geographically remote subsistence hunters, reindeer herders, fringe dwellers" as the "Lappish problem."[27]

While Erskine's "regional solutions" for northern Sweden have been consistently celebrated in architectural discourse as exemplars of a promising Arctic building typology, there remains another history to follow. The anthropologist Robert Paine describes the nineteen-fifties and nineteen-sixties in northern Scandinavia in terms of what he calls the industrial and "urban invasion of the tundra."[28] Hugh Beach has similarly argued how, alongside the expansion of the timber and hydroelectric industries, mining, and, in particular, tourism—to which Erskine's Borgafjäll hotel and Svappavara housing project are connected implicitly—posed "the worst threat . . . to [reindeer] herding" in the postwar period.[29] We could, perhaps, take the Sámi artist Nils-Aslak Valkeapää's 1971 book *Greetings from Lappland* as one possible starting point from which to generate an alternative reading of Erskine's Arctic endeavors. When Valkeapää writes, "Samiland is full of the great marks of

colonialism," he offers us, I think, potential routes toward a revisionist historiography of Erskine's work. Acknowledging Valkeapää, we might rethink Erskine's work in northern Sweden as a type of Scandinavian colonial architecture, which, in line with the Nordic nation-states' expansionist policies of the Cold War era, sought to render the Sámi "a vagrant on the scantily-covered hillsides."[30]

We find similar problems with Erskine's legacy elsewhere. Melanie McGrath's recently published documentary novel *The Long Exile: A Tale of Inuit Betrayal and Survival in the High Arctic*, which—like Valkeapää's text—makes no mention of Erskine or his work, nonetheless suggests new perspectives on the architect's work in Arctic Canada.[31] McGrath gives us an astounding history of Resolute Bay in the postwar period that, for me, stands violently at odds with the Resolute Bay of the 1977 *Architectural Design Profile*. Tracing a nightmarish story of deception and human suffering, which begins in 1932 with the Canadian government's forced relocation and subsequent imprisonment of three-dozen Inuit from their homes on the Hudson Bay to the new communities of Resolute Bay and Grise Fiord on Ellesmere Island, McGrath gives us "an accidental gulag" as the very antithesis of Erskine's "Arctic sunflower."[32] We read, for example, of a Resolute Bay in the nineteen-fifties where "Fighter jets and spy planes screamed overhead, scattering what little game there was and making hunting there more or less impossible." With time, the scene only worsens: "By the mid-sixties almost every Inuit family at Resolute Bay had been affected by alcoholism. Things got so bad at the Inuit settlement that in some homes there was nothing to eat for days except the chewing gum the airmen handed out to the children to keep them quiet while they had sex with their mothers."[33]

This was, at least in part, a reality of the Resolute Bay Erskine would first encounter, only a few years later, in 1973. It may be that Erskine, still armed with a diehard modernist belief in the benevolent powers of architecture, thought his twelve-point "grammar" for Arctic building would prove a panacea for the region. Regardless of his intentions, a story of grave injustice and great human suffering lurks behind the disarmingly happy cover image of the 1977 *Architectural Design Profile*. It is precisely such stories—as yet untold in the historiography of "Arctic Architecture"—that seem to call Erskine's entire Arctic experiment into question.

ENDNOTES

1
Mats Egelius, "Vår tids hjälte? / A Hero of Our Time?," *Arkitektur* 7 (1981), pp. 4–9, 49–50.

2
"Profile 9: Ralph Erskine," *Architectural Design* 11–12 (1977), p. 735.

3
Ibid., p. 735.

4
Nunavut, Canada's largest and newest federal territory, officially separated from the Northwest Territories in 1999—the eventual result, at least in part, of a 1976 lands claim negotiation between Inuit and the Canadian government.

5
Reprinted in Peter Collymore, *The Architecture of Ralph Erskine* (London, 1982), p. 26.

6
Ralph Erskine and Ken Tadashi Oshima, "Interview with Ralph Erskine: Reflections on Six Decades of Design," *A+U* 414 (2005), p. 9.

7
Mats Egelius, "Ralph Erskine: The Humane Architect," *Architectural Design* 11–12 (1977), p. 783.

8
Aldo van Eyck, Peter Smithson and Jacob B. Bakema, "Discussion / The Sub-Arctic Habitat," in Oscar Newman, ed., *CIAM '59 in Otterlo* (Stuttgart, 1961), p. 169.

9
Ralph Erskine, "The Sub-Arctic Habitat," in Oscar Newman, ed., *CIAM '59 in Otterlo* (Stuttgart, 1961), pp. 160–68.

10
Reprinted in Collymore 1982 (see note 5), pp. 27–30.

11
Erskine 1961 (see note 9), p. 162.

12
Ralph Erskine, "Building in the Arctic," *Architectural Design* 5 (1960); reprinted in Collymore 1982 (see note 5), pp. 216–17; Ralph Erskine, "Indigenous Architecture in the Subarctic Region," *Perspecta* 8 (New Haven, 1963), pp. 59–62.

13
Erskine 1960 (see note 12), p. 216.

14
Erskine 1961 (see note 9), p. 161.

15
Erskine 1960 (see note 12), p. 216.

16
Erskine 1963 (see note 12), p. 59.

17
Ibid., p. 59.

18
Erskine and Oshima 2005 (see note 6), p. 9.

19
Charles Jencks, "Introduction," *Architectural Design* 11–12 (1977).

20
Peter Collymore, "Swedish or British," *Arkitektur* 7 (1981); Collymore 1982 (see note 5); Hugh Pearman, *The Ark, London: Architect, Ralph Erskine* (London, 1993); Karin Winter, "Arkitekten som lärde sig åkaskidor," in Karin Winter, ed., *Ralph Erskine Arkitekt: Utställning* (Stockholm, 1988).

21
Collymore 1982 (see note 20), pp.12–13.

22
Ralph Erskine, "Democratic Architecture: The Universal and Useful Art," in Denis Lasdun, ed., *Architecture in an Age of Scepticism* (London, 1984), p. 87.

23
Egelius 1977 (see note 7), pp. 807–08.

24
Ibid., p. 784.

25
Erskine 1960 (see note 12), pp. 216–17; Erskine 1963 (see note 12), p. 59.

26
Erskine 1961 (see note 9), pp. 161–62.

27
Noel Dyck, ed., *Indigenous Peoples and the Nation State: Fourth World Politics in Canada, Australia and Norway* (Newfoundland, 1985), p. 3.

28
Robert Paine, *Dam a River, Damn a People? Saami Livelihood and the Alta/Kautokeino Hydro-electric Project and the Norwegian Parliament* (Copenhagen, 1982), p. 74.

29
Hugh Beach, *Reindeer-Herd Management in Transition: The Case of Tuorpan Saameby in Northern Sweden* (Uppsala, 1981), p. 270.

30
Nils-Aslak Valkeapää, *Greetings from Lappland: The Sami: Europe's Forgotten People*, trans. B.Wahl (London, 1983), pp. 3, 10.

31
Melanie McGrath, *The Long Exile: A Tale of Inuit Betrayal and Survival in the High Arctic* (New York, 2006).

Arctic Perspective Cahier No.1

PART 3

On Board Isabella

John Ross and Stijn Verhoeff

On the 11th of December, 1817, I received a letter, dated the 4th, from Sir George Hope, one of the Lords of the Admiralty, informing me that two ships were to be sent out, to "ascertain the existence or non-existence of a north-west passage" and desiring me to let him know, by return of post, whether my health was equal to the arduous service which must be expected on such a voyage, and whether I should wish to undertake it; at the same time informing me, that I should be accompanied by a man of science, and by Greenland pilots accustomed to navigate those seas. To this I returned for answer, that I had no hesitation in undertaking the service, particularly with the promised assistance.

On the 16th I received orders from Sir George, to make the best of my way from Loch Ryan to Greenock, in the Driver (which ship I commanded), and when superseded to proceed to London; I was also informed that, in the mean time, they would be getting on with the ships, which had been already selected.

Having arrived in London on the 30th of December, and received directions, I visited the ships, and chose the Isabella, as being the most proper ship for the senior officer; I was afterwards employed in planning the accommodations, and directing the various alterations which were necessary for the safety of the ships and comfort of the crews, as well as in obtaining information from the different masters of the Greenland ships, and other persons who had been accustomed to navigate the icy seas.

On the 15th of January, 1818, the four ships were commissioned, the Isabella, of three hundred and eighty-five tons, and the Alexander, of two hundred and fifty-two tons, for the north-west; and the Dorothea, of three hundred and eighty-two tons and the Trent, of two hundred and forty-nine tons, for the polar expeditions. The following establishment of officers and men for the Isabella, while employed on a voyage of discovery in the Arctic Regions, with the pay per month allowed to the officers and men, was finally settled.

1	Captain	£46
1	Lieutenant	£18
1	Purser	£ 7
1	Surgeon	£39
1	Assistant Surgeon	£18
2	Midshipmen	£ 6
1	Clerk	£ 6
1	Master (merchant)	£ 5
1	Mate (merchant)	£ 4
1	Carpenter	£ 6
1	Sailmaker	£ 4
1	Cook	£ 4
4	Leading Men	£ 3
31	Able Seamen	£ 3
1	Serjeant of Marines	£ 5
1	Private Serjeant of Marines, 2d Class	£ 1
4	Private Serjeant of Marines, 3d Class	£ 1

The officers were paid six months and the seamen three months' pay (besides river pay) in advance. During the time the ships were repaired in dock to strengthen them against the pressure of the ice, they were frequently visited by the Comptroller and Commissioners of the Navy; every suggestion which was offered for the improvement of the plans were attended to, and no pains were spared by the officers of the yards, and men employed in their different departments.

On the 22nd of February the ships came out of dock, were moored alongside the receiving ships at Deptford, where they embarked the following necessaries, provisions and stores, which had been in preparation for the voyage:

BOOKS

Mackenzie's Travels in America
Hearne's Travels in America
Phipp's Voyage to the North Pole
Ellis's Voyage to Hudson's Bay
Vancouver's Voyage, 3 volumes and Atlas, folio
Wallis, Carteret, and Cook's Voyages
Dampier's Voyages
Portlock's Voyages
Dixon's Voyages
Meare's Voyages
Coxe's Russian Discoveries
Barrington's Miscellanies
Forster's Northern Discoveries
Astronomical Observations of Wales and Bayley, 1772 to 1775
Astronomical Observations of Cook, King, and Bayley, 1776 to 1780
Astronomical Observations of Byron, Wallis, Carteret, and Cook from 1764 to 1771
Brongniart's Mineralogy
Bakewell's Geology
Turton's Linnaeus
Mackenzie's Iceland
Falconer's Patagonia
Cartwright's Labrador
Tumbull's Voyage
Crantz's History of Greenland
Barney's Collection of Voyages

INSTRUMENTS

7	Chronometer, 3 the property of Government, and 4 of individuals
1	Clock, the pendulum of which, cast in one solid mass, vibrates on a blunt knife-edge, resting in longitude sections of hollow cylinders of agate.
1	Transit
1	Variation transit
4	Dipping needles
1	Repeating circle
1	Hygrometer
1	Hydrometer
1	Cyanometer
10	Thermometers (in Fahrenheit)
1	Self-registering Thermometer (in Fahrenheit)
1	Barometer (with attached Thermometer)
1	Dip micrometer
1	Dip-sector
1	Macrometer
1	Electrical Apparatus
1	Common Mountain Barometer and Companion

1	Sextant
1	Theodolite
2	Anglometers
1	Beam-compass
1	Brass scale
1	Gunter brass scale
1	Case drawing instrument
1	Protractor
1	Artificial horizon and mercury
1	Sympiesometer
	Altitude Instruments

COMPASSES

2	Kater’s azimuth compasses
1	Walker’s azimuth compass
1	Insulated steering compass
4	Alexander of Leith’s steering compasses
1	Crow’s steering compass
2	Burt’s patent binnacle

ARTICLES OF WARM CLOTHING

50	Flushing jackets
50	Monkey jackets
100	Red shirts
100	Flushing trousers
50	Swan-skin drawers
100	Wadmill hose
50	Sea boots
50	Scarlet and Pawn caps
100	Milled mits
50	Fur caps
50	Comfortables
50	Ancle shoes
60	Wolf-skin blanketing
1000	Russian mats
6	Rifles complete
6	Seven-barreled guns
6	Wall pieces
3600	Ball cartridges for the above

WHALING EQUIPMENT

81	Whale lines
5	Whale boats
1	Ice boat
24	Ice anchors
18	Ice saws
12	Ice axes
10	Pairs of ice spurs
2	Ice pool hooks
2	Suits of sail
10	Ice poles
24	Whale lances
5	Knives, chopping
5	Knives, blubber
6	Harpoons, plain
1	Harpoon’s gun
1	Deep sea lead, 150 pounds weight
1	Deep sea lead, 100 pounds weight
1	Deep sea lead, 50 pounds weight

STORES FOR REPAIRING WHALE BOATS

612	feet of one inch Board Fir
528	feet of half inch Board Fir
1568	feet of three-quarters inch Board Fir
10	Deal-wood flitches
5	Stems
5	Stern ports
100	feet of keels, running
310	Gun wales
10	Cants
5	Bollards
10	Aprons
64	Futtecks
60	Knees
51	Floors
36	Bow and after timber
88	feet of Thwart stuff
196	feet of Board elm, one inch

511 feet of Board elm, three-quarters inch
56 lbs. Ocham, white
56 lbs. Rosin
12 Ring bolts
12 Stem bands
20000 Nails, 6 lbs.
10000 Nails, 8 lbs.
10000 Nails, 10 lbs.
4000 Nails, 4 lbs.
4000 Nails, 3 lbs.
4000 Nails, 2 lbs.
4000 Nails, 22 oz.

PRESENTS TO THE NATIVES ON THE WEST COAST OF GREENLAND AND THE COAST OF AMERICA, &C.

24 Brass kettles
300 Knives, forks and cases
20 Axes, felling, wedge
150 Butchers' knives
150 yards of Flannel, red
100 yards of Flannel, yellow
100 yards of Flannel, blue
10 Felling axes
200 Looking-glasses
2000 Needles, Whitechapel
15 lbs. Vermilion
36 Cutglasses
1500 Gun-flints
100 Scarlet-milled caps
14 Swords
20 lbs. Thread, red
16 Pistols
30 Pair of Scissors
40 Razors
50 Course handkerchiefs
100 Awls, shoemakers'
35 Rifles
2500 Balls for Rifles
102 lbs. Snuff
4 Cases earthenware
150 lbs. Soap
250 Pikes
200 cwt. Iron hoops
129 gal. Gin (English)
13 cases of various Beads and Cowrie Shells
40 Umbrellas

PROVISION FOR TWENTY-SIX LUNAR MONTHS

18200 pounds of Bread
18200 pounds of Flour in lieu of bread
1300 pieces of Beef, 8 lbs.
2600 pieces of Pork, 6 lbs.
7800 pounds of Flour
1000 pounds of Suet
600 pounds of Raisins
1950 pounds of Cocoa
3900 pounds of Sugar
162,5 bushels of Pease
30 bushels of Oatmeal
700 gallons of Wine
1923 gallons of Spirit
325 gallons of Vinegar
2600 pounds of Tobacco
2273 pounds of Lemon Juice
2273 pounds of Sugar for Lemon Juice
2184 pounds of Candles
1589 pounds of Molasses
22 gallons of Capillaire
20 lb. of Salep Powder
chaldrons of Coal
53 cases of essence of Malts and Hops
5200 pounds of Preserved Meat
1300 quarts of Vegetable Soup
1300 quarter-pints of Concentrated Soup
144 essence of Spruce
40 pounds of Mint
30 pounds of Balm
16 pounds of Sage

6 pounds of Thyme
6 pounds of Marjoram
3 pounds of Savory
6 pounds of Lemon Thyme
20 pounds of Celery Seed
6 tons of Potatoes
10 bushels of Turnips
20 bushels of Carrots
4 bushels of Parsnips
12 bushels of Onions
224 pounds of Sour Crout
20 gallons of pickled Walnuts
20 gallons of pickled Cabbages

RULES AND REGULATIONS

issued by me to the officers and ships' companies at the commencement of our voyage, and at a subsequent period, which were to be attended to, in addition to the "Printed Instructions" of His Majesty's Navy.

I
The officers to be in three watches:
1 Lieutenant Robertson and Mr. Bushnan.
2 Mr A. M. Skene and Mr. Wilcox.
3 Mr J. C. Ross and Mr. Lewis.

The seamen are to be in three watches, and each watch divided into two parts.

II
The senior officer of the watch is to write in the rough log every occurrence filling up the different columns during his watch, or as soon as possible after he is relieved; he is also to pay attention to the meteorological occurrences, and in like manner insert them in the rough journal; both the log and journal are to be kept in charge of the sentinel at the cabin door.

List of Meteorological Observations to be attended to
1. Hour.
2. Temperature of the air.
3. Temperature of water at the surface. Or, if in deep water, the number of fathoms and temperature to be inserted in the column of remarks
4. Specific gravity of water. N.B. A bottle is to be saved for this purpose at each watch
5. Altitude of marine barometer
6. Altitude of thermometer on deck
7. Direction of the wind
8. Weather; whether cloudy, clear, snowy or rainy
9. Hygrometer
10. Soundings
11. Rise and fall of the tides
12. Velocity of the tides
13. Drift or directions of the tides or currents.
14. Officers signature
15. The Aurora Borrealis is to be inserted in the remarks, with observations on its effects on the magnet.

III
The Captain is to be immediately acquainted
1. On a change of wind
2. On the change of weather
3. On appearance of fog, (when the helm is to be put up to join the Alexander, if at a distance to leeward, out of musket shot.)

4. On the appearance of fog clearing away
5. On appearance of snow
6. On the appearance of ice (sufficient to impede progress)
7. On the appearance of shoal water
8. On sight of land
9. When necessary to reef topsails
10. When necessary to let out reefs
11. On any sudden squall.

IV
The deck is never to be left without an officer, but when the ship is taken suddenly in a squall, the sentinel is to call the captain, at this desire of the officer.

V
The officers are required to take observations whenever an opportunity offers; they are to keep a reckoning, and to give in a day's work regularly at noon, as follows:

Latitude by observation
Latitude by account
Longitude by chronometer
Longitude by observation
Longitude by account
Course
Variation
Bearings
Distance

VI
Three marines are to be selected, as constant sentinels to relieve each other at the door of the cabin. The sentinel for the time is to have charge of the magazine, instruments, stores in the cabin and gunroom, the rough logs and journals, half-hour glass, the light in the binnacle, and other things which may be put into his charge by the captain and officers; a board is to be hung up to remind him of the winding up of the chronometers at nine o'clock, which he is to report to Captain Sabine; and he is not to be relieved until he can report to the next sentinel that the chronometers are wound up and compared.

VII
Serjeants Martin and Wise are to have charge of the stoves on the lower deck, the issue of fuel, the fires, and lights, which they are to report, regularly to the officer of the watch, as well as any disturbances in the ship.

VIII
Captain Sabine is to be called whenever he leaves word with the officer of the watch, or when any remarkable object is seen in the sky or water.

IX
The course is never to be altered without the captain's knowledge or directions, except in a case of immediate danger, when the helm is to be put up or down, as may be best to avoid it.

X
A good look-out is to be kept from the mast-head in clear weather, and mast-head man to be relieved

every hour, or as may be hereafter directed in daily orders.

XI
The lower deck is to be cleaned under the direction of the officer of the morning watch, who is to report, when finished, to the captain; the men are to be sent on deck, and the 'tween decks aired and dried by stoves.

XII
The surgeon and assistant surgeon are to pay particular attention to the temperature of the lower deck, and any thing else which may be conducive to the health of the crew; the latter is to visit the coppers, as is usual in the naval service. It is expected they will pay the greatest attention to natural history; and a report will be required of the anatomy of the various subjects of natural history which may be met with on the voyage.

XIII
No expenditure of any article is to be made, but what is regularly reported to the captain and purser, and inserted in the log.

XIV
The bearings and distance of the Alexander is to be inserted in the end of every watch in the logbooks, and, if lost sight of, the time and bearings when last seen are to be inserted, as also the time and bearings when she is next seen, and every necessary step to be taken to join her if out of the musket shot.

XV
All signals whether general or telegraphic, are to be inserted in the log; the time when made, the number, and the purport.

XVI
The officers are required to take sketches of the land, and of different objects may appear in their watches.

XVII
All objects of natural history, geology or mineralogy, are (if possible) to be brought carefully on board, and if any cannot be removed on account of their size, sketches and drawings are to be taken of them.

Our equipment and preparations being completed, the expedition was inspected by his Royal Highness the Duke of Clarence, and subsequently by the First Lord of the Admiralty, and Comptroller of the Navy, who were pleased to express their approbation of the manner in which the Ships were strengthened and fitted; and the provision being stowed, we dropped down to Galleons on the 4th of April. On the 16th we arrived at the Nore, where I received my final instructions.

Source: John Ross, *A Voyage of Discovery, made under the Orders of the Admiralty, in her Majesty's Ships Isabella and Alexander, for the Purpose of Exploring Baffin's Bay* (London, 1819)

Edited by Stijn Verhoeff

Fieldwork Journal: Foxe Basin 2009

Matthew Biederman, Marko Peljhan

July 30, 2009

Arrive Igloolik without our bags due to a soda shortage in Pond Inlet, the next hamlet for our plane to land at. The plane's cargo hold is full of soda instead of passenger luggage. This is no surprise, as a single can of soda costs about $4 in Nunavut; we surmise that the soda companies have created an economy so that their soda is the priority and the passenger bags can wait. We do what we can without most of our luggage. That evening we check into the co-op hotel. Fortunately for us, our cargo, which was shipped a week earlier, is already at the airport, so most of the equipment is available.

July 31, 2009

We connect with Zacharias Kunuk, filmmaker and one of the founders of Igloolik Isuma Productions, who has been one of the main organizers of the trip out on the land for us to visit traditional sites with Igloolik elders and their families. He is having issues with his boat motor, but he's sure he'll have it running in time to leave. Zach introduces us to "Harry" Ikerapik Ittukssarjuat, our guide, and we begin to discuss details of the trip with him.

Ikerapik introduces us to his younger brother, Charlie, who will come along with us to help out, and shows us the boat. It's an eighteen-foot welded aluminum hull with a plywood custom bow cabin where we can store anything that can't be exposed to the elements. The boat is powered by dual Yamaha outboards, sixty and forty horsepower. It will be a tight fit with the UAV,[1] five people, and our other gear, but we'll make it.

At night, around 11 pm, the light is amazing, and everyone gathers at a man-made point to fish. We give it a try, but don't get any bites. In fact no one catches a fish, but there were a few seals that swam so close that someone managed to shoot one and haul it ashore to everyone's excitement. The meat is divvied up and shared on the spot. Nighttime during the midnight sun in Igloolik is an action-packed time. Children are out playing and riding their bikes, a group of teenagers have set up a small amplifier and are picking away at a guitar near shore (Nejc, the third API crew member, even joins in for a riff or two), ATVs race up and down the roads. Mornings are very subdued, and there isn't much movement until afternoon.

1
Unmanned Aerial Vehicle

August 1, 2009

We spend a good part of the day troubleshooting and prepping our technical gear. Nejc and Marko run through a checklist and test the UAV on the ground in the middle of Igloolik, which attracts the attention of the local youth. Who are these two strange guys, speaking a strange language with airplanes…? Matthew spends some time putting the rest of the sensor network together and tests the water quality meter. Unfortunately some of the gear still hasn't arrived, so we spend a good amount of time urging our airline to find our luggage and get it to us. There is only one flight per day into Igloolik, and we get to know the baggage handlers from Montreal, Ottawa, Iqaluit, and Igloolik pretty well. The old maxim of logistics versus strategy comes to mind.

That night we move out of the co-op hotel where we have been staying, and move into Celina Irngaut's house, an old friend of Marko's. She and her husband, Sandi, are taking advantage of the good fishing and weather and living out on the land—they are on Igloolik island but out of town, so they kindly let us stay in their home. They even gave us a beautiful arctic char they recently caught, and Nejc roasts it up expertly for a dinner with Ikerapik and Charlie, his younger brother.

Preparing to leave Igloolik

August 2, 2009

Today we sort out the rest of our supplies. We shop for sundries and grub with Ikerapik and Charlie, and go to the co-op to purchase the gasoline we'll need for the boat. Nejc and Matthew work on the boat to install a GPS system and EPIRB.[2] Marko and Ikerapik register the boat with the Canadian Coast Guard, and Ikerapik has to name the boat. It turns out that the boat was his father's and he left it to him before he passed away, so he decides it should be given his father's name. Qrunnut. We have a boat with a call sign now, and feel more assured that if there is any real trouble we can at least contact the Coast Guard. Mental grin. No idea how far or how long it would take, but it helps morale.

Calm seas for our departure

The whole hamlet of Igloolik is very excited and informed about the trip out on the land. Lots of different families are going with us. There is an incredible amount of activity at the shoreline. As we walk around town with him, Paul Quassa introduces us to many of the people who will join us. Paul is also an old friend, one of the main negotiators of the Nunavut Land Claims Agreement. He is an expert in all affairs related to the territory. He takes us on a spin around the bay on his boat. He mentioned these new aluminum boats when we last met in Berlin in February and when the preparations for this trip started. It's great to get out on the water for the first time.

2
Emergency Position Indicator Radio Beacon—a satellite based communications and tracking beacon used in the case of emergency.

August 3, 2009

Today is the day of departure out on the land, and our destination is Ikpik Bay. Ikpik is about 250 km away, and it is estimated that it will take a couple of days to get there. Unfortunately we can't leave until we get our luggage, which has now been delayed for three days. There is a flight due in the early afternoon and we pray that the rest of our bags are on it. We see off the rest of the group—about ten boats in all, and they depart from the bay with a great fanfare. Happily, our bags arrive shortly after, and we hastily rearrange our stuff and hope that we haven't forgotten anything as we pack it on to the boat. By the time we get all our gear on the boat and the three fifty-five gallon drums of fuel, we have just enough room to stand or sit on our cases.

It's a beautiful day, and with Ikerapik at the helm we quickly catch up to some of the slower-moving boats in the group. The water is like glass, and the sky is bright blue. There's a little sea ice in the bay at Igloolik, but it isn't until a few hours later that we encounter anything substantial.

Our camp on Qaggiagvik (Koch) Island

The pack ice we encounter hangs together in bands, so we are forced to slow down a bit while Ikerapik weaves through the narrow passages of ice. It is here we meet the first boats from our party, two canoes parked at a larger ice floe so they can collect some of it for fresh water. We take advantage of the stop to make some tea and have a snack of some bannock.

The entire party and all the community in Igloolik communicate through CB and HF[3] radio (CB on the boats, HF on land), so we are able to follow their progress and hear the ice conditions as we catch up with the group.

A few hours later, Ikerapik manages to catch up with Paul Quassa and Zacharias's boat, and we all decide to stop off at Maniqtuuk Island to have a look around. It's clearly a breading ground for arctic terns who aren't too happy to have all of us there—they squeak, swoop and dive at our heads, and generally try to chase us off. As we start to leave the ice is far too thick and we are forced to turn around and head back to Qaggiagvik (Koch) island, passing a bunch of walrus resting on ice floes and being suspicious of our intentions. We will remain on Qaggiagvik for three days due to the ice and weather conditions.

August 4, 2009

In the morning we begin to realize how ridiculous our southern "dome" tents are next to the traditional tents everyone else is using. Theirs are roomy, dry, and warm canvas, compared to our nylon domes that have little more than room to sleep. It pours rain all day today—not much can be accomplished. No flying or electronics, so we decide to fish a little, but catch nothing again. We decide to eat some of our packaged dehydrated food, read, talk, and get to know Ikerapik and Charlie. Luckily, while we were having a chat with Paul earlier, he stopped and pointed out a small leafy plant growing out of the rocks. It turns out that it is an edible plant, and has a slightly sour, almost citrusy taste. Adding this to our meal really livens up the dish.

August 5, 2009

It's a little drier when we wake up, but there is thick fog and lots of ice around. The pack ice sort of rides the tides and currents of Foxe Basin back and forth. When the tide is rising, the ice heads west along our shore, and as the tide recedes, the ice comes back to the east and is finally deposited on the ground as the tide reaches its lowest point. So we watch it go back and forth, and prep the UAV for a flight.

3
Citizen Band radio and High Frequency radio connections are widely used on the land. The Department of Fishing and Hunting gives out call numbers, and regularly monitors standard channels for emergencies. The radio nets are used as a "one to many" communication for everyone within range, and organically regulate themselves.

We find a suitable place for a flight about half a mile in the interior of the island. Nejc and Marko decide to do a flight with the live video feed in the hope of scouting the ice conditions ahead and finding us a way through. Unfortunately, there is a hiccup with firmware revisions, and we have a temporary grounding, with no video feed to report the conditions. Nejc and Marko figure out the issue quickly enough, but the repairs take a little while, and we lose the opportunity to fly that day.

We try our hand at fishing again from shore, and we even ask Ikerapik to take us out offshore to troll a bit, but to no avail. We're surprised at the fact that we have been so unsuccessful in catching any fish; we're using the same lures that everyone else is; spoons of various sizes and colors. We talk with Charlie a little bit and he casually mentions he has a net and asks if we think we should throw it out. We agree it's worth a try, but imagine that this doesn't seem to be a good spot to catch anything at all. Nejc and Charlie deploy the net and upon returning Nejc asks how we will know if there is a fish in the net. Charlie explains that the smaller buoys will bounce around a bit. No more than ten seconds later exactly that happens! We are in luck—our first arctic char catch. We rejoice, eating some sashimi style and fry up the rest, share it with everybody, and head off to bed happy despite the rain that has not let up all day.

August 6, 2009

We awake to a clear enough day and everyone decides that it's time to leave Qaggiagvik—there isn't much here besides a stepped beach made of loose stones. What looks totally empty to us, though turns out to be a treasure trove for the elders. They have all managed to find an incredible amount of artifacts—small carved dolls, sunglasses made of bone, *qamutik* sled parts, needles, and any number of items. We haven't found anything ourselves. Paul tells us that some of these artifacts are obviously of "Greenlandic" Inuit origin. Ikerapik himself knows that his ancestors crossed Baffin Bay and moved to Baffin Island in the past times. It all makes sense, but the distances are enormous.

We head out weaving between the ice, but it's pretty dense and we don't get very far. The fog becomes really thick as we head offshore, and we lose a boat from our party in it. They don't have a GPS, but thankfully everyone has a radio, so we're able to keep in contact. We cut our engines and everyone is quiet in hope of being able to hear their boat and direct them back to us. We hear nothing, and our visibility is about three meters at best.

So we float for a while, listening and talking to them on the radio. Marko first tries with a whistle, but they don't hear it. Then it's decided to fire a rifle toward an ice structure in order that they can hear us. Still nothing, then a second shot is fired. This time it works and shortly the boat finds the rest of the party, and we continue together carefully. Because of the ice and fog, we only make it as far as back to Maniqtuuk, with its birds—which is almost really part of Qaggiagvik—there is water between the two, but it is not navigable. We notice an interesting electronic chart problem here, where the electronic chart we have on the boat is off by about a few hundred yards. We will fight this issue all the way to the end of the journey. Navigation . . . we also have VFR charts of the area to plan the flights which help a lot. We unload and pitch our tents again, always amazed at how fast the large traditional tents go up in comparison to our dome tents.

The elders discuss and share their finds

August 7, 2009

We wake up to a light rain and in an effort to be productive, we build a fly tent workspace out of a tarp and some improvised poles from oars and some other stuff we found and borrowed. It works out well—we get our radios and antennas up, plus solar panels for charging and recharging. We find a large walrus skull and place it atop a pole at the entrance to our tent, hoping for some shamanistic power to protect us. There are lots of bones in this place; it's obviously been a hunting camp for ages.

Dexter, who is working with Isuma as the go-to digital communications person, is determined to connect their satellite Internet connection dish, but nothing comes out of it for a day. He has taken the dish and receiver from the office roof and taken it up to a low rock outcrop in hope of getting a connection. With a lot of fussing over the course of two days and an intervention by Marko, who notices that the RX/TX[4] cables are turned around, we manage to get it connected and powered up. The only sad part about it is that to recharge the batteries and power the sat receiver, they stick to a gasoline-powered generator. It could easily all be run from a small set of solar panels plus a small wind turbine. We're exclu-

Partial view of camp on Maniqtuuk, with improvised tent at left
At center Matthew prepares tea, while Abraham looks on at left

sively using solar panels for our power needs, which is three laptops, the batteries for the UAV, the sensor net, and our HF radios. It works well enough; we have just the bare minimum of power input from the system, especially whenever there is a fog (which is turning out to be pretty often), and it takes us an hour or two to get everything wired up. We begin to conceive of a small portable power system that can be easily packed and quickly deployed for precisely this type of use out on the land. It would be incredibly useful here, everyone has some electronic devices with them. Note to self—build it.

August 8, 2009

Still lots of ice today, so we don't continue toward Ikpik, but since we have all our gear set up, we spend the day making some radio contacts—Marko manages to talk to people in Croatia, Bosnia, and the Svalbard Islands. They are all really excited to have contact with someone on an island in the Arctic, and it makes for some good radio geek chatter. Global communication is totally possible with a minimum amount of gear up here. Being surrounded by water certainly helps. Matthew's vertical antenna doesn't seem so efficient here without anything high to fix it to. It receives a lot, but doesn't get out so well. Marko's G5RV, a multiband dipole, is much better suited for this type of enterprise.

At night, Abraham, one of our elders in the next tent, sings "ayaya" songs in Inuktitut for a long time. This and global radio chatter make for a very special and inspiring mix. Note to self—learning Inuktitut is a priority for our team—at least some basics must be met.

Nejc tries to fish for a few hours with a rod and reel, but so far the only way we've managed to catch any fish is with a net. Another item for "next time." A group went hunting, though, and managed to bring a seal back—the first for our group, and everyone was really excited. It was pretty quickly cleaned and divided among everyone. Everybody is really happy for some country food for the first time since we've been out on the land.

August 9, 2009

It's a really clear day today and everyone decides it's time to move, as we've been in essentially the same location for about five days now. It'll be slow going, but we need to find a way through the ice. As our gear is mostly unpacked it takes us a little longer to load up and shove off. As we are trying to leave, the boat becomes wedged on a boulder as the tide is going out—it takes all five of us pushing to free the boat. The tide is ebbing so quickly it looks like a river flowing over rocks that are becoming exposed. In the end, we finally make it to open water, and we advance, moving north, looking for a passage through the ice, but there is nothing. All the larger boats like ours have a person standing on the bow in hope of seeing just a little further into the ice field.

We dream of a new UAV design, one which could be easily launched from a boat and send live video of the ice field back to the boats. While we were on land and connected to the Internet we looked at Environment Canada's ice reports, but they are incred-

ibly general and geared toward larger ships rather than personal-sized boats, so these reports are more or less useless for trips like this one. And they do not even report ice conditions for this part of Foxe Basin at this time of the year. We downloaded some MODIS imagery,[5] which is marginally helpful. With the correct sensors, the UAV could even be used to monitor all sorts of water conditions, not just ice.

We decide to stop at a small island nearby to the north, with a little hill. Ikerapik goes to the top with his binoculars searching for passage, and he finds one and comes running down the hill, yelling for us all to move quickly. Everyone hops into the boats and we are off; we have to move fast, as the hole could close as quickly as it opened. Ikerapik's passage in the ice was a good one, and we are soon back in open water at top speed toward Baffin Island.

Finding our way through the ice

By afternoon we arrive at a campsite on Baffin where about half of the party had already arrived while we were on Qaggiagvik. There is a meeting with the elders, who discuss which might be the best inlet to head to next and where the whales might be. Abraham and Herve Paniaq are the most vocal. Everybody else mostly listens; the women are handcrafting all and making pointed comments from time to time. Everybody takes notice. We witness this very important dynamic for the first time. Ilutulaaq

5
Moderate Resolution Imaging Spectroradiometer, an instrument onboard NASA's Aqua and Terra satellites that provides nice, almost real color earth imagery

Kangiqllu (Steensbury Bay) is decided upon, and we have a little rest in the sun as everyone packs up their boats. Finally reunited, the entire party heads up the bay.

Matthew logs water quality measurements of the ice in Foxe Basin

When we arrive at a suitable campsite in the bay, we have a look around. While it is a beautiful fjord with cliffs to the north and small beaches in front of them, it is not the most ideal location to fly the UAV, and we are eager to make some flights after the repair. We also learn in a discussion with Ikerapik that he grew up for a number of years at what was supposed to be our destination, Ikpik.

While the rest of the party makes camp at Ilutulaaq Kangiqllu, we all discuss the pros and cons of staying here or going to Ikpik. There is a long silence before the final decision. We are waiting for Ikerapik. At one point, he simply says: Ikpik. And starts the engines. After all the stories of the place that we had heard, and Ikerapik's history there, we make the unanimous decision to leave the party and head to Ikpik on our own. The ride is amazing, smooth, and long. We make it there by nightfall. As we

are approaching the mouth of the Ikpik River, Ikerapik starts to cry. Memories, of his father Qrunnut, of the family, childhood. He hasn't been back for thirty years, and Charlie has never been there. By this time of summer, the sun has already begun to set, giving us real darkness, though not until around 11 pm. We put up our tents amid the ruins of the settlement. Ikerapik and Charlie do it in five minutes; we of course take our usual fifteen. Charlie gives us a quick lesson in the operation of their rifle, as there are only the two tents, and it isn't safe without both of us having one. Both Ikerapik and Charlie are very excited to hunt caribou. Ikerapik tells us stories of how the caribou herds move south across the ice in front of Ikpik in the fall, and in the spring they head north behind Ikpik across the land. These migrations would afford the settlement a good portion of their sustenance throughout the year.

The central building at Ikpik used as social space, with church in background

August 10, 2009

We are awoken really early by the thunder of the Ikpik River, one of the major rivers connected to the Baffin glacier system. In daylight, we have a better chance to see the remains of the settlement, built by Father Francis Fournier in 1973. Three circular, stone walled houses, where the families lived, stand at the southern end nearest the river. Centrally located, there is a larger rectangular building that served as a social space, kitchen, and the living quarters of Father Francis. About a hundred meters behind it stand the remnants of the church, a long, rectangular two-storied building complete with a knave that had three eye-shaped windows facing in three directions.

Workspace "hangar" built with found aluminum tubing

What a location. A few hundred meters in one direction is Ikpik bay and the river, full of arctic char. In the other direction, further behind the church, is a freshwater lake with crystal clear water, where we—and undoubtedly the settlement—got all of the drinking water. All around us are small hills and the whole place is in the middle of a caribou migration route. An ideal location to live.

As Matthew and Marko look for a suitable place to set up the HF antennas (church to kitchen it is in the end…), Nejc considers if we could build a workspace with the building material that we find everywhere. The whole site is littered with all sorts of items. A half-built kayak, lots of aluminum poles, which we learn from Ikerapik had been brought from a nearby FOX-1 DEW line site,[6] on nearby Rowley Island, after it was deserted, and many other useful scraps, such as wooden panels that probably served as roofing for the family houses.

After a few hours of experimenting, Nejc convinces all of us that there is enough there to build a small hangar-like shelter for us to work in. The aluminum poles, gaffer tape, and some architectural imagination do the job nicely. We cover it with our blue tarps, which we used already for the micro-workspace on Maniqtuuk, and Ikerapik and Charlie contribute another of their own from the boat. We also find an old table, a bench, and some shelves. The UAV radio and sensor hangar on Ikpik is built by noon. While we were busy with

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Distant Early Warning Line, a system of radar stations in the north set up to detect Soviet ballistic missiles and Arctic air traffic during the cold war.

our small architectural recycling "experiment," Charlie and Ikerapik started looking for caribou—and they found them. A small herd to the south, across Ikpik River, is visible. Charlie spends the rest of the day observing them through the scope of his gun and with binoculars. We try a few times, but have a hard time distinguishing the caribou from the Baffin Island landscape—inexperienced southern eyes, we guess. Ikerapik is looking north and east all the time, without binoculars, just contemplating. Our radios and antennas are up by the afternoon, and we contact the rest of the party, which has firmly set up camp in Ilutulaaq Kangiqllu, via HF radio. We talk to Paul Quassa and ask when the rest of the people are coming. He answers, "Maybe tomorrow. Maybe, if there will be no caribou or something else on the way." Everybody is very low on food, all the animals seem to be hiding, and apart from the one seal, the hunters haven't had much luck for a week now.

Dinner at the hangar. Left to right: Ikerapik and Charlie Ittukssarjuat, Marko, and Matthew. Ikerapik's and Charlie's tent in the background

In the late afternoon we set up the UAVs and start scouting for a good take-off and landing spot. The best is found to the north of the settlement, in the direction of the old Ikpik airstrip. Tomorrow we will fly. We plan everything properly, the batteries are loaded and checked again, and we manage to set up our small solar power system, even though by now we know we have underestimated its size for our needs. Matthew sets up the sensor network. Nejc takes a sort of shower in Ikpik River. He does not recommend the experience to the rest of us. The river is probably two degrees celsius. We spend the evening cooking and sharing some arctic char that was caught in the net during the day, this time with dill and other

more temperate-climate spices. Delicious. The fish are huge, and as it's summer, not too fatty. Ikerapik and Charlie join us; we ask a lot of questions about the history of the place, and Ikerapik shares his memories of a childhood with Father Fournier and his family at Ikpik. The talk turns toward the next day and caribou. That night, Nejc wakes up and says that something is walking around our tent. We tell him to chill out, assured since we have the loaded rifle for our safety in the front of our tent. The Great White Ones[7] come even here when they are hungry. And now they are hungry, since the ice has gone from Ikpik bay. The next day Ikerapik tells us that he's heard of the White Ones hunting caribou during the summer.

August 11, 2009

We force ourselves to wake up early today. We want to take advantage of the stable weather for a flight. All around the tent and the camp, nothing but caribou steps. We were indeed visited during the night. Nejc did not hear something that was not there. Ikerapik is out and about, determined to follow the steps wherever they will lead him. He is gone by the time we finish breakfast. Charlie is also excited, and is perched atop the church not moving away from his scope. The small group of caribou across the river is still there. We attempt our first flight and have some problems with the software again, but they are quickly fixed. We know that the next flight attempt with the unmanned system must be a success. We talk to Ilutulaaq Kangiqllu on the radio and understand that two boats are on their way: Zach's boat with elders and the film crew to do a shoot, and a canoe with Lukie, Mary, and their children. Lukie and Mary were also former residents of Ikpik. They decide to stay overnight and also set up a tent closer to the shore in no time. We manage to contact Zach on the boat radio; they are indeed on their way.

Charlie decides it's time to make a move for the caribou, and asks Marko and Nejc to go with him on the boat over the bay to stalk them. While Charlie, Marko, Nejc, and Ikerapik are all busy with the caribou hunt, Matthew documents Ikpik and talks to Mary at length about the history of the place.

He learns about the day-to-day activities there—and Mary is happy to share some stories and answer his questions. We learn that there was an airstrip just over a small ridge, and there were

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Ikerapik explained that in Inuit culture, they don't refer to the animals by name—you'll either call the ones you don't want closer or scare off the others you need to survive—and we abide.

two windmills for electricity. They had a wonderful garden where they grew all sort of vegetables. She says Father Francis believed in a very communal living situation where everyone would "eat together, laugh together and cry together." Mary says she'd live back here in an instant rather than live in Igloolik. She also talks about how much the land has changed in such a short time. The now steep beach used to be much less so; however, overall the land is less sandy, and there is much more vegetation.

Nejc prepares the C-ASTRAL BRAMOR UAV for an orthophoto flight over Ikpik

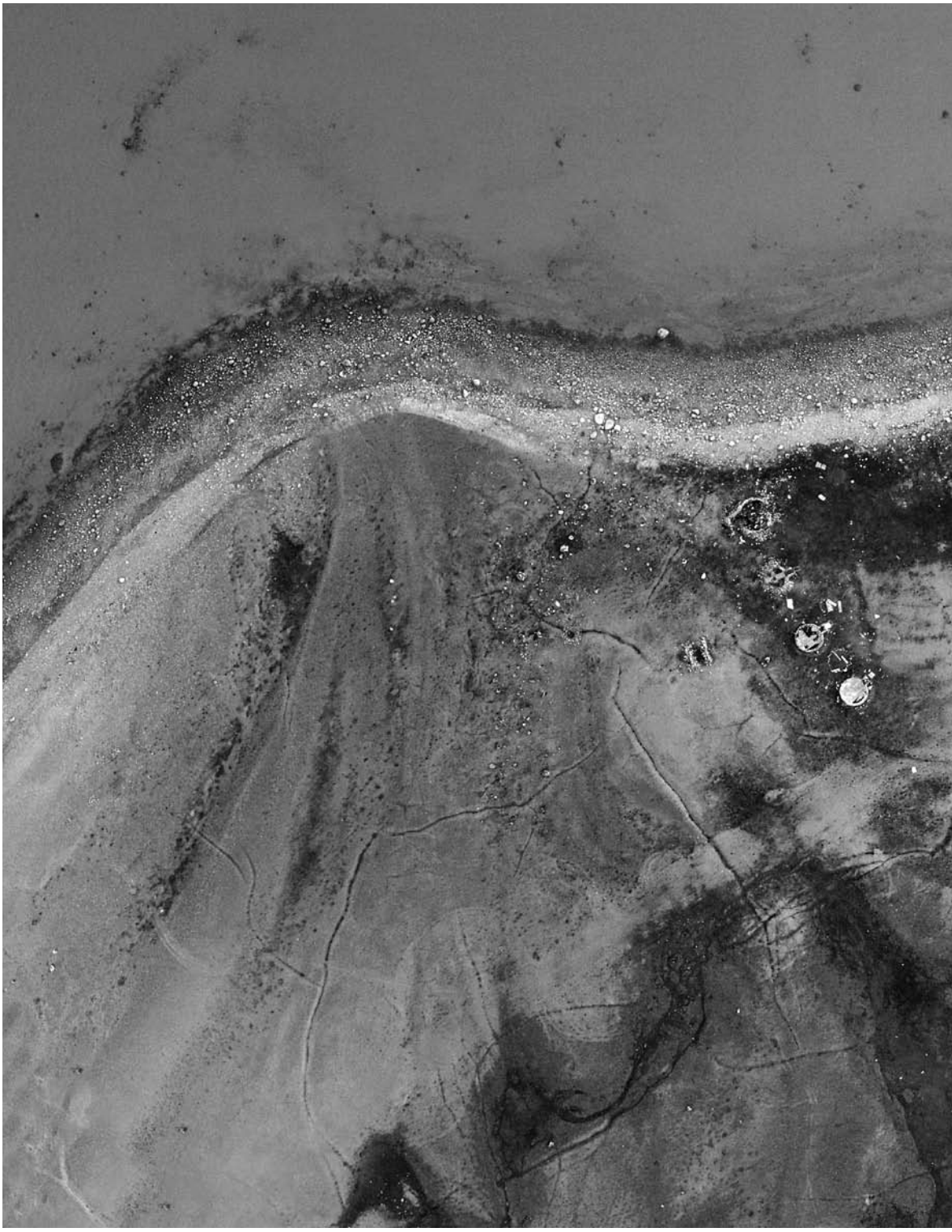
The hunt over the river was a success. Charlie manages to get three caribou in a few minutes and he's really excited—they are his first ever. Nejc and Marko are diligent observers of an old and ongoing relationship. It's a very powerful experience for those who haven't grown up with it. By the time the caribou are down, Zach's boat arrives. Marko and Nejc leave with Ikerapik's boat to escape the low tide, but Charlie and the rest of the crew stay to film and prepare the game, meat, and hides. Returning back to the main camp, a decision is made to try another flight to do the second set of orthophoto images. A flight pattern is established in order to map the whole Ikpik bay area, including the area where Zach's party and Charlie are at the moment. This time the flight is uneventful and the landing picture perfect. Job well done, and it looks like the bugs are ironed out of the system. While the UAV is in the air, Ikerapik appears from the distance, with half of a bull caribou packed into a backpack on his back. What a day. The fortunes have turned. Ikerapik unloads his bounty, has a short nap and tea break, and is off again to the mountains, approximately a ten-kilometer round trip, to bring the rest back.

At dusk, we see Zach's boat leaving, and strangely he doesn't appear to be stopping at Ikpik. Ikerapik realizes that they are leaving with his brother, so the decision is made to immediately go on the boat in order to pick up Charlie while they are still near. We get Charlie back, but the caribou stay with Zach to bring to the larger group. Ikerapik is not very happy about the "kidnapping," but in a few hours everything is forgiven. We spend the rest of the evening preparing the caribou and listening to Ikerapik tell the day's hunting stories. He tracked it nearly five kilometers in one direction before bringing it down with a single shot. We are quickly becoming aware that Ikerapik is an incredible hunter and very skilled in living on the land. He tells us that he teaches survival skills to young people who are now growing up in the hamlets rather than the way he did.

Nejc prepares caribou the way a venison filet mignon would be done in Slovenia. Ikerapik and Charlie like it a lot. Natural, with a dash of salt at the end. We had a hunt of our own going on with the UAV imagery and are extremely satisfied with the performance and quality of the images. Tomorrow the weather will change, there seems to be a large system coming in from the southwest, and we are worried how our workspace will survive. At 3 am it starts raining.

August 12, 2009

We've had great weather over the past few days, but today our luck has run out. There is constant rain and a small storm rages around the bay. We consider it a good test for our makeshift structure. It survives the strong winds and keeps everything dry. We spend the day trying to avoid getting completely soaked, and talk to Paul Quassa several times via the HF radio net, which we dub the "Nunanet." The Nunavut HF network is a fantastic tool used by the Inuit to communicate everything, from hunting stories to weather, search and rescue, and just general discussions. It is totally open, and essentially one waits their turn and then calls for the person they are trying to contact. In general, people use numbers assigned by the Hunting and Trapping Association, but we notice that Paul's number is different from the rest; we'll have to get the rest of the story on that. The Nunanet is a great example of how well HF radio can work to bring together families and connect people out on the land over long distances without an expensive infrastructure in place. The radios are inexpensive, and the antennas are just long wires. After the tent is set up, everyone installs their radio next. When Marko met Brian Springer back in 1994, Brian told him of the Nunanet and storytelling traditions in and around Igloolik. This was



Ikpik... C-ASTRAL BRAMOR UAV instant tactical orthophoto, August 12, 2010 — Detail


IKPIK

a very important moment of interest in the North for him, with the realization of an operational technology that is used much more imaginatively here than in the South.

In the late afternoon the rain stops, and we fly the UAV again. Clearly all the bugs have been worked out, and we get set up and in the air in no time. The light is perfect and another beautiful orthophoto set is created. We spend the rest of the day discussing the future potential of using UAV technology by the Inuit for their travel, tossing around ideas for sea ice observation, wildlife scouting and even community planning needs. There's no shortage of ideas and it only further reinforces the idea that there is a total acceptance here to marry advanced technology and traditional ways. Ikerapik starts cleaning around the settlement; there is a lot of small metal and structural debris everywhere. All the litter is a sad sight; the place is clearly visited often, and everyone has left their trash there, and even managed to grafitti the entire inside walls of the church with markers and pens.

Ikpik was a utopian experiment by a southern Catholic priest to make Inuit live in a more appropriate setting than the government-mandated settlements. Of course it wasn't completely altruistic and existed as a Catholic conversion process. It all ended when Father Fournier became too sick to stay there, and people were forced to move back to Igloolik. Later, via the Nunanet, we hear that Wednesday was a very successful day in Ilutulaaq Kangiqllu too, and that a Beluga whale was caught. Maktak for everybody there. We're a little disappointed to miss the feast, but we're not lacking here, and in fact we have a surplus of arctic char, which is sent back with Mary and Lukie to share with everyone there.

August 13, 2009

Thursday morning is our departure from Ikpik. We dismantle and pack the cover of our structure that has served us so well, but leave the aluminum frame intact, wondering if it will still be here on our next visit. We hope it will be used by anybody else who decides to set up camp there. Ikerapik is eager to get back to the rest of the group and hurries us along. We are fighting against the tide again. Everything is quickly packed and it is a very sad moment to leave this incredible place.

Matthew tells us that Mary told him they had a beautiful garden. We wonder why there are no greenhouses in settlements anymore. It would make total sense, and it could work. Mary said she particularly enjoyed having the garden. Better a diet of fresh vegetables cooperatively grown than soda pop and sugar snacks in

all forms. We all agree and understand the establishment of a community garden/greenhouse will definitely become part of the API agenda in the future.

As we leave Ikpik, we are treated to a majestic rainbow over the whole bay, end to end. A contemplative mood falls over the boat after that; there is so much to consider after our visit to Ikpik. In the afternoon we arrive at Ilutulaaq Kangiqllu. There is a lot of activity, with probably around forty people staying in the camp. It is the first time the entire party that left from Igloolik has been in a site that fit us all. The campsite is stunning, we are on a point with a tall hill on the end, and the satellite dish is atop it, beaming Wi-Fi down to camp. On the other edge of the point is a high hill from which, if you climb to the top of it, you can see the glacier of Baffin Island. The hillside is flush with amazing berries, like small wild blueberries,

Nejc shows the aerial photos to the group at Ilutulaaq Kangiqllu

Nighttime at the camp at Ilutulaaq Kangiqllu

but a little more tart. There are simply baskets full of them. Across the water is a huge cliff wall, hundreds of meters high. We think next time we need to bring along a geologist and biologist—we've seen such a variety of landscapes and plant life, it seems like a specialist would be in heaven here and a great asset to the rest of the party.

Toward the evening there is a group meeting, sort of a reflection on the incredible weeks we have shared together, to give thanks for the country food and for our safe return to Igloolik the next day. The elders all have an opportunity to say their own words, and Ikerapik helps us with brief translations. Learning more Inuktitut is a key skill; we've picked up some phrases and words, but not enough. Everyone is quite emotional, being back out on the land together, and at the end of the service, the Nunavut anthem is sung—and everyone cries while singing it. It's far from sad in the end, however, and afterward there's lots of laughing and joking. The "eldest" man and woman elders are recognized in our group, and everyone takes pictures of them together.

We leave the hangar without covers and hope for its future survival.

It is a calm night; we are finally getting almost complete night now. We are invited to some tents and join in discussions and storytelling. The fact that the traditional tents are large enough so that there is room for social space in the tent only reinforces that our southern dome tents are built from a completely different perspective and serve a totally different function than these here. The southern dome tents just shield you from the elements—they are hardly a home. Our site here feels more like a community than a campsite. People come and go from tent to tent, making visits and

playing games together. Tomorrow this incredible mix of people, us and Dexter from Isuma, the only Qallunaat in the group, will leave Baffin Island back to Igloolik.

August 14, 2009

Morning starts early and it is clear that the dismantling process will start immediately. We did not unpack much of our gear, so this time we are packed very quickly. Everybody helps everybody else, since we have to catch the tide to leave the bay. In an hour, this large temporary settlement disappears, which we capture through a time-lapse video on our camera. Herve Paniaq joins us on the boat for the journey back. His presence makes us somehow very proud. It is exciting to have him and Ikerapik on the same boat. He is an incredible man with an incredible life story.[8] He smokes his pipe and drinks tea on the way home, constantly scouting for sea animals. Marko is reminded of another elder, whom he met and spent time with on the land in 2006. Pauloosie Qulitalik, one of the founders of Igloolik Isuma productions. He was the one who told him that the endeavor of API is worth pursuing in Nunavut. He is also the one and the same Qulitalik who teased him a lot with aged narwhal and the one who spotted the Great White One during that trip, a chase that ended with the bear jumping on Marko and Saso's *qamutik*. No lives were lost. Qulitalik was almost the same generation as Paniaq, an elder everybody respected, full of knowledge and wisdom.

With Ikerapik at the helm and Paniaq observing the world around us, we move very swiftly through the ice floes back toward Maniqtuuk, where an additional supply of gasoline is waiting for us. We're not so excited to return to the island where we had been stuck due to weather, and hope the same doesn't happen on this visit. It turns out that the Great White One visited while we were gone and completely cleaned up the remains of the seal and the fish we left on shore. There are no bones left, nothing but a stain on the rocks on shore. Everyone pumps fuel from the barrels, taking what they think they will need for the return trip.

We move on swiftly, since Ikerapik wants to be back to Igloolik by the end of the day. On the way back, the sea is the roughest we've experienced so far. We are heading into a strong westerly wind with half meter, high frequency waves. It makes for a very bumpy ride. There are some comical moments during this dance, as we all are bouncing out of our seats, or off our feet. We're pretty

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See http://www.tradition-orale.ca/english/herve-paniaq-36.html

loaded down with Ikerapik's caribou, and our gear has slowly become more and more disorganized throughout the trip.

We try to persuade Ikerapik that we are going too fast and we fear we will run out of fuel. We're within sight of Igloolik Island when that is exactly what happens, but fortunately, there is a canoe nearby and we manage to "refuel" by siphoning from their tank at sea near Igloolik point. This time, strategy almost overran logistics…. It was quite an operation, but skillfully carried out by Charlie and his uncle, who was aboard the canoe. As we approach Igloolik, we realize that we are the first boat back. Due to the weather, almost everybody else stayed back on Tangle Island and will return tomorrow. We unpack our gear and plan to make the most out of the next two days before our flight back south. We decide to make a flight over Igloolik to map the town, as Paul really expressed that this would be helpful for them to use in city planning meetings. We also meet Guillaume Ittukssarjuat Saladin, who directs Artcirq and kindly offers us hot showers and dinner at his place. It's our first one in two weeks, it feels good. And Guillaume is an amazing interlocutor and mediator of the two cultures. We connect with him very quickly and the evening could be very long if everybody were not so exhausted.

Herve Paniaq scouts the route back to Igloolik

August 15, 2009

We camp in the Isuma offices and studio for the next two nights, since all of our gear is here. An early wake-up for everybody, packing our gear and equipment, deciding what stays in Igloolik versus what comes south with us. The less brought back and forth the better. We

transport the cases with equipment we need in the South to the airport and leave it with the one Canadian North employee there. Close to noon, all the other boats appear on the horizon heading toward town; it is a majestic sight. The whole hamlet is on the shore to meet them, and we all help unload the enormous amounts of gear that everybody had with them. Everyone is greeting their loved ones on their return and telling stories of the trip. After everyone is unpacked, we start preparing for the UAV overflight of Igloolik.

In the early afternoon, we monitor the tower frequency and major VFR[9] traffic-hailing frequencies for if anything is approaching Igloolik. Marko walks up to the airport, but surprisingly no one is in the tower. The flight is picture perfect. The images of Igloolik from the air are incredible. We will create posters of Ikpik and Igloolik and bring them up next time around. The water around Igloolik is so blue and clear it looks like a tropical island from above. Indeed a surprise, but then again we have been monitoring the water quality, and all the sensors tell us in fact there is very little particulate and dissolved oxygen near the surface.

The evening is spent saying goodbye to everybody. We meet with Celina, Guillaume, Ikerapik, Charlie, Paul Quassa, and Zach and promise to see each other next spring. The rest of our gear is packed for our flight out on Sunday.

August 16, 2009

We spend the morning on a walking tour around Igloolik, soaking in the last hours of being here. We photograph a number of *qamutiks,* as it has become clear that in some way, we will build from the *qamutik* in our future designs. It's a proven technology over the ice, and we saw dozens of them in all shapes and sizes. We even saw one being used to move a boat over land, pulled by an ATV.

Our flight takes off for Iqualit without a hitch, and we're all simultaneously sad to leave the island and excited for the next phase of the project. We spend the flight making lists of things we brought that we didn't need, things we wish we would have had, and most importantly, what to do next. The architectural jury will meet soon, and we can move forward with our ideas and build upon some good ones, which will hopefully be included in the submissions we have received.

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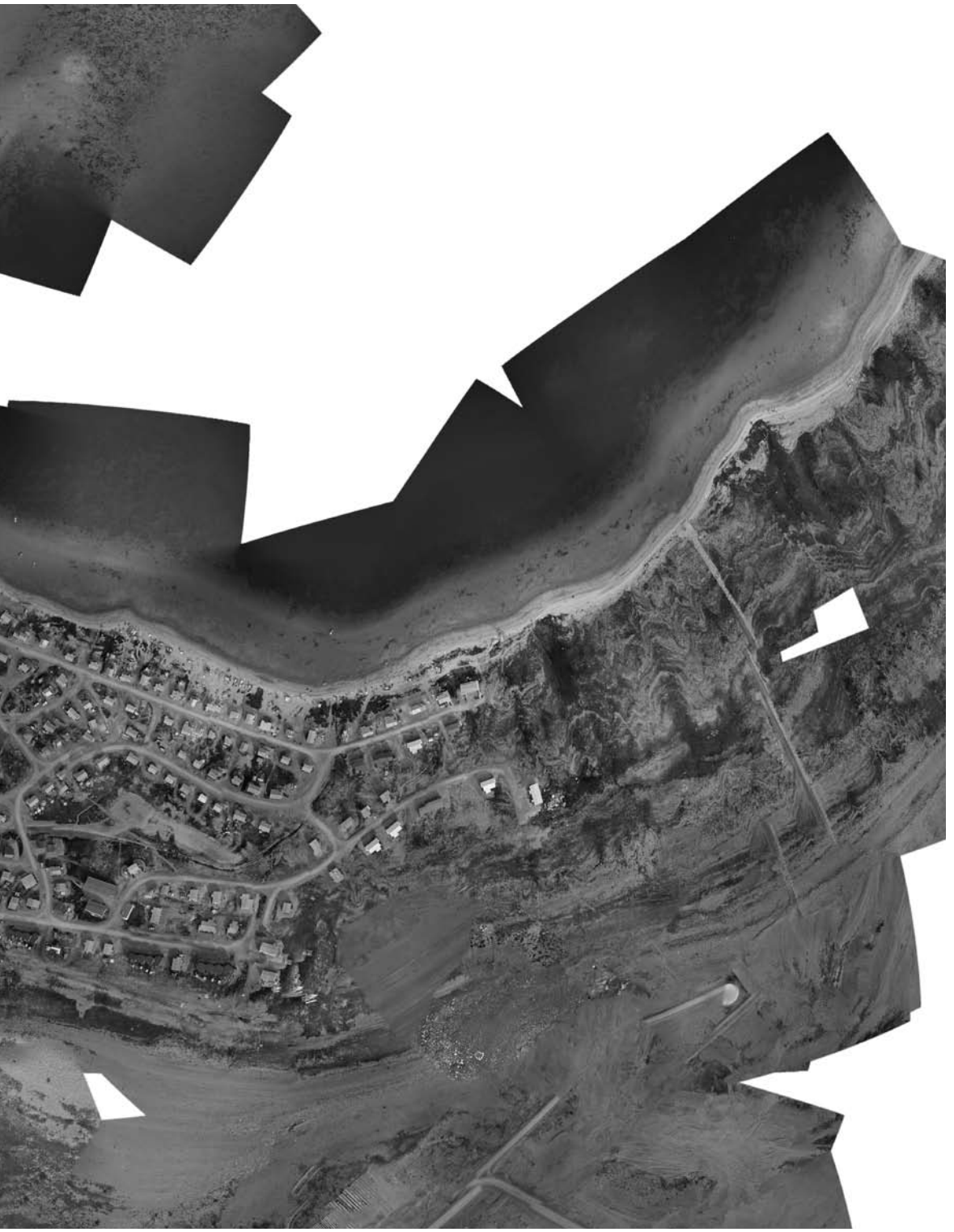
VFR stands for visual flight rules in aeronautics. Air traffic in remote areas uses a specific set of predefined frequencies to announce their positions so other traffic is aware that they are indeed there.

Igloolik... C-ASTRAL BRAMOR UAV instant tactical orthophoto, August 15, 2010 — Detail



CONTRIBUTORS

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is an architect living in Berlin. He is a cofounder, editor, and publisher of the architecture magazine *An Architektur,* as well as a part of the Cooperative for Display Politics. His work as an exhibition designer explores the possibilities of public mediation, spatial narrations, and educational approaches in the medium of an exhibition. In 2008–09 he was conducting a research project on participation in architecture at the Jan van Eyck Academie, Maastricht.

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is a conceptual artist and a theater and radio director by profession. He is the founder and director of the arts and technology organization Projekt Atol, Ljubljana, Slovenia, and the codirector of the University of California's Institute for Research in the Arts, Santa Barbara. Peljhan worked on the Makrolab project that focuses on telecommunications, migrations, and weather systems research from 1997–2007, and the Interpolar Transnational Art Science Constellation during the International Polar Year 2006–09. He is the recipient of many prizes, including the Golden Nica at Ars Electronica (with Carsten Nicolai) in 2000 and the UNESCO Digital Media Prize in 2004. He holds an appointment with the Department of Art and the Media Arts & Technology graduate program at the University of California Santa Barbara.

Sir John Ross

CB, (June 24, 1777–August 30, 1856) was a Scottish rear admiral and Arctic explorer. Ross was the son of the Rev. Andrew Ross, minister of Inch, near Stranraer in Scotland. In 1786, aged only nine, he joined the Royal Navy as an apprentice. He served in the Mediterranean until 1789 and then in the English Channel. In 1808, he acted as a captain of the Swedish Navy and in 1812 became a Commander. Six years later, in 1818, he received the command of an Arctic expedition organized by the Admiralty, the first of a new series of attempts to solve the question of a Northwest Passage. This entailed going around the extreme northeast coast of America and sailing to the Bering Strait. He was also to note the currents, tides, the state of ice and magnetism and to collect specimens he found on the way. In April of that year, Ross left London with two ships, the Isabella and Alexander, and in August reached Lancaster Sound in Canada.

Marilyn Walker

(PhD) is an Associate Professor at Mount Allison University, where she teaches courses in arctic ethnography, cultural ecology, and indigenous knowledge. She made her first visit to the arctic in the nineteen-sixties, then worked as an archaeologist, museum curator, researcher, and ethnographer. Archival research on circumpolar shelter was carried out in the N.W.T., Nunavut, Yukon, and Alaska, at Eskimo Museum, Churchill; the Smithsonian, Washington; Museum of the American Indian; and at the Scott Polar Research Institute. Field research was undertaken in the Canadian north, Alaska, Siberia, and Mongolia. She is an International Fellow of the Explorers' Club.

Stijn Verhoeff

is an artist living in Amsterdam who works with film, photography, and printed matter. His "abstract documentaries" deal with inhabitable places, specifically focusing on the contemporary representations of their cultural histories. Recent projects are *Mesopotamian Marshes,* a film and photography project investigating a nature reserve located at the disputed border of Iran and Iraq, and *Three times Arctic archaeology,* a video with live narration about historic and current research in the Arctic. Currently he is working on *Lapon d'une Renne, Voyages into the Arctic Regions,* a book dealing with the digitization of libraries and the history of Arctic exploration. This book will be published by the Jan van Eyck Academie, Maastricht, in the spring of 2010.

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Timeline Arctic Perspective 2009 — 2012

WORKSHOPS

2009	(Jan)	Potsdam	Potsdam, DE
2009	(Sept)	Lorna	Reykjavik, IS
2009	(Feb)	UCIRA	Palm Desert, US
2010	(May)	Canada House	London, UK
2010	(May)	API	Igloolik, Nunavut, CA

ARCTIC FIELD WORK

2009	(July – Aug)	Igloolik, Foxe Basin	Nunavut, CA
2010	(May)	Iqaluit, Kinngait, Kanngiqtugaapik, Igloolik, and Mittimatalik	Nunavut, CA
2010	(July)	Inuit Circumpolar Conference	Nuuk, Kalaallit Nunaat
2010	(Oct)	International Territory of Svalbard	Arctic Ocean
2011		Various locations	Nunavut, CA
2011		Qaanaaq	Greenland
2012		Yamal, Sakha, Chukotka	Russia

PUBLICATIONS

2010	(May)	Cahier No. 1	Architecture
2010	(Aug)	Cahier No. 2	Geopolitics and Autonomy
2010	(Oct)	Cahier No. 3	Technology
2010	(Oct)	Cahier No. 4	Landscape

EXHIBITION

2009	(Nov)	Kibla	Maribor, SI
2010	(May – Sept)	Canada House	London, UK
2010	(June – Oct)	PHOENIX Halle	Dortmund, DE

CONFERENCE

2010	(Sept)	PHOENIX Halle	Dortmund, DE

The Arctic Perspective Initiative (API) is a non-profit, international group of individuals and organizations whose goal is to promote the creation of open authoring, communication, and dissemination infrastructures for the circumpolar region. We aim to empower the North and Arctic people through open source technologies and applied education and training. By creating access to these technologies while promoting an open, shared network of communications and data, without a costly overhead, we can allow for further sustainable and continued development of culture, traditional knowledge, science, technology, and education opportunities for peoples in the North and Arctic regions.

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