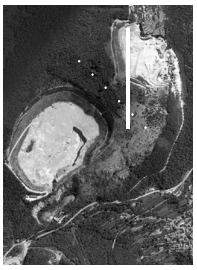
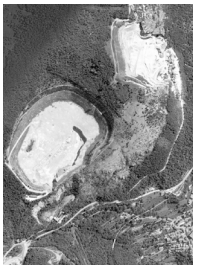


ARCHIPELAGO OF WONDERS

Conception of *Anatoli Bugorski Independent Research Institute for Scientific Failures*
by Dominika Kopiarová for Borders&Territories graduation studio
Transient Liquidities along the New Silk Road

Exercise in Entropy. Gradual disintegration of the limestone quarries.



MSc4 Borders&Territories graduation studio

Transient Liquidities along the New Silk Road

Theory paper by Dominika Kopiarová

TU Delft
Department of Architecture
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Filip Geerts [first architecture tutor]
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Mauro Parravicini [building technology]

AY 2021/22
June 22, 2022

Archipelago of Wonders

Thank you to my tutors, Filip, Stefano, Mauro, and Piero, as well as the rest of Borders&Territories graduation studio teaching staff.

Special thanks go to my parents, my big sister Lucia, my partner Juan Pablo, and my friends—both old and new—for your unlimited love and support.

Transient Liquidities along the New Silk Road

Archipelago of Wonders

A fascination with obsolescence as an inherent landscape condition lies at the core of a project that thematically focuses on fundamental scientific inquiry in reference to the ***Big Science***. It stems from the preconceived tensions between the notions of ***progress*** versus ***obsolescence*** and ***accident.*** The former is a result of the latent dependency of economic progress on the perpetual obsolescence of space, as is argued in the theory paper entitled ***Territories in Obsolescence.*** And the latter is a controversion that scientific progress and technocentric accident are two sides of the same coin as was argued by the philosopher Paul Virilio in his ***University of Disaster***,[1] which provides the critical understanding of the scientific experiment and introduces the counter notions of accident and disaster.

The project addresses these themes from an architectural standpoint in Trieste—a territory of contested history and sovereignty—once envisioned as the city of science and knowledge. Hence the title Archipelago of Wonders, based on the autobiography [2] of the same name by the theoretical physicist Paolo Budinich. Budinich—a proponent of the reunification of Science and Philosophy—argued Trieste should play a significant role in fundamental research on an international scale.

[1] Virilio, P., 2009. *University of Disaster.* Wiley.

[2] Budinich, P., 2000. *L'arcipelago delle meraviglie.* Milano: Di Renzo.

Transient Liquidities along the New Silk Road

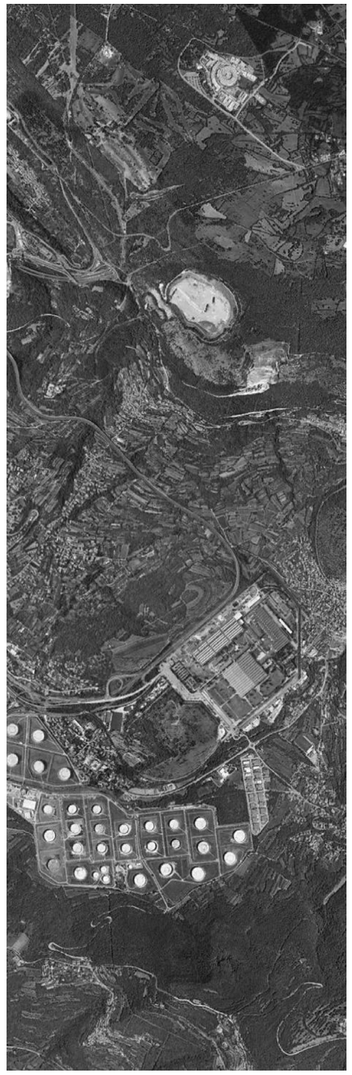
View of Trieste from Santuario di Monte Grisa—the National Shrine of Mary Mother and Queen—located at an altitude of 300 metres on the edge of the Karst Plateau above Barcola and Miramare Castle.

Taken with zenit E (35 mm) in October 2021.

[abstract]

[body] **12**

[appendix]



Trieste and a zoom-in to Bagnoli della Rosandra.

[source: Google Earth Pro]

Political protest at Piazza della Borsa in front of the Trieste Libera—the Free Trieste Movement headquarters.

Taken with zenit E (35 mm) in October 2021.

I *A City of Nowhere*

Trieste—a city at the Adriatic coast—a cosmopolitan port governed for over half a millennia by the Austro-Hungarian Empire—annexed by Italy, later split into two zones, gaining the short-lived status of the Free Territory—and shortly after returned to Italy.

This represents a single narration on the border city that in its clarity paradoxically obscures the meaning as Trieste was often put into a role of a symbol for competing ideologies on the notions of territory and identity—whether Italian, Austrian or as the Iron Curtain frontier of Western Europe. Trieste's border condition stems from its territory at the junction of the everchanging state borders, being rather defined by what it is not. ***A City of Nowhere***—as described by Jan Morris.[3]

[3] Morris, J., 2002. *Trieste And The Meaning Of Nowhere.* Da Capo Press.

"Here we describe obscurity in reference to the vagueness of the city as defined by the others—the states in power, individual political movements or global networks. An imposter with a multitude of irreducible subjectivities, consciously taking on the roles that are imposed onto it. That is different from obscurantism in the sense of a deliberate restriction of knowledge even though deliberate obscurantism is too present as a result of conflicting power tendencies.

This has led to our understanding of the problem of linear narration around border and territory that often describes states as self-evident spatial entities, clearly demarcated from each other by territorial boundaries that they patrol and regulate—identifying the binary us-them, domestic-foreign. Categories unfit for the complexity of Trieste.

In the historical research and mapping, we, therefore, embrace a multitude of historical narratives and the non-linearity and fragmentation as integral to approach the obscure nature of Trieste. If we identify obscurity-absence of clarity as a productive force in unfolding the city from a historical and geopolitical perspective rather than a hindrance to precision in spatial representation and mapping. In that case, we can instrumentalise it to further the research better to comprehend this non-linearity of the realities of Trieste. Obscurity as a method to uncover the complex, the conflicted, the multiple, the unknown, requires this problematisation to be accessed to further the research to discover forms of knowing that reveals the non-simplified and the not-digested." [4]

[4] Contribution to the collective research *The Others' Trieste.*

Political protest at Piazza della Borsa in front of the Trieste Libera—the Free Trieste Movement headquarters—inside the Art Nouveau palace Casa Bartoli built by the architect Max Fabiani in 1905.

Taken with zenit E (35 mm) in October 2021.

View of the natural reserve Bagnoli della Rosandra.

Taken with zenit E (35 mm) in October 2021.

View of the oil tank farm in Zona Industriale Est—in close proximity to the natural reserve Bagnoli della Rosandra.

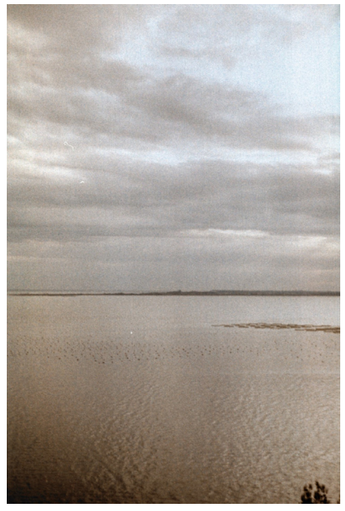
Taken with zenit E (35 mm) in October 2021.

View of the port in Muggia from Molo Esterno.

Taken with zenit E (35 mm) in October 2021.

Santuario di Monte Grisa—the National Shrine of Mary Mother and Queen—located at an altitude of 300 metres on the edge of the Karst Plateau above Barcola and Miramare Castle.

Taken with zenit E (35 mm) in October 2021.



View of Castello di Miramare, built from 1856 to 1860 for Austrian Archduke Ferdinand Maximilian—later Emperor Maximilian I of Mexico—based on a design by Carl Junker.

Taken with zenit E (35 mm) in October 2021.

Rozzol Melara
taken with zenit E
(35 mm) in October
2021.

Rozzol Melara
complex—built
in the ’80s by
the Autonomous
Council Housing
Institute—was
imagined as a
self-sufficient
part of the city for
2,500 inhabitants.
The intervention
consists of a
200-meter-long
quadrilateral cut
by a diagonal road
passing over the
system of common
services.

Taken with zenit E
(35 mm) in October
2021.

Rozzol Melara
taken with zenit E
(35 mm) in October
2021.

View of the cranes at the Trieste Marine Terminal—Molo VII.

Taken with zenit E (35 mm) in October 2021.

View of the disintegrating oil tasks of the former Aquila oil refinery from the eclosed park at Strada delle Saline.

Taken with zenit E (35 mm) in October 2021.

II *The Post-Industrial Archaeology*

Trieste's postindustrial legacy is linked to its port at the Adriatic coast. The industrial archipelagos can be easily recognised in plan within the city fabric and delineated in sections by tall fences and modifications to the soil and air.

A dual territorial shift emerges, geographical and typological. The former—creeping along with the port, leaking into the hinterland and the Mediterranean sea while leaving industrial artefacts in the polluted obsolete landscape. The latter is a shift less perceptible—from the heavy industry of blast furnaces and refineries to the temporality of cranes, warehouses, and oil tanks.

The geographical shift transformed the fabric of Trieste that can be read as a visualisation of a cycle of territorial obsolescence. The map constitutes the postindustrial layers—the former now wasted, the current obsolete, and the future postindustrial landscape— that effectively define the form of the city. It illustrates an eclectic collection of the postindustrial artefacts—silos, gasometer, blast furnace—that stand as obsolete monuments to the postindustry. The drawing inspired the fascination with obsolescence as an inherent condition of those sites of production.

A Dreher brewery ˣ
B Stock liquor distilleries ˣ
C Porto Vecchio warehouses ˣ
D silos at Porto Vecchio ˣ
E Piezometer of the hydrodynamic plant ˣ

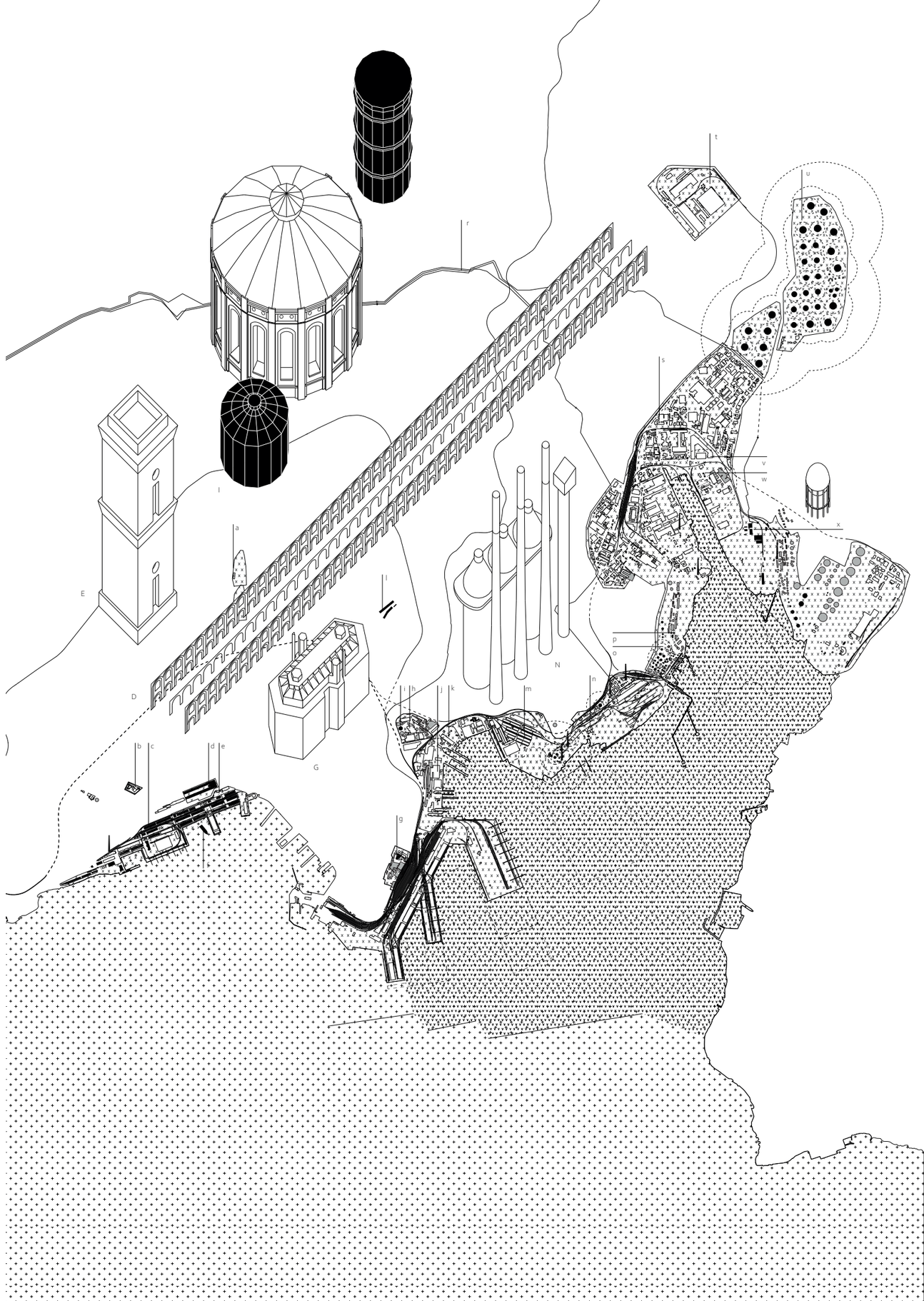
F Ursus floating crane ˣ
G Sant'Andrea machinery factory, canteen and service building designed by Marcello D'Olivo ˣ
H Acegat electricity and gas company ˣ
I Broletto gasometer ˣ

J Austrian Lloyd's arsenal ˣ
K San Marco shipyard
L Fiera di Trieste ˣ
M timberyard
N Servola steelworks and blast furnace ˣ

O oil port terminal
P Gaslini oil refinery ˣ
R Trans-Alpine pipeline
S Illy coffee factory
T Bagnoli della Rosandra

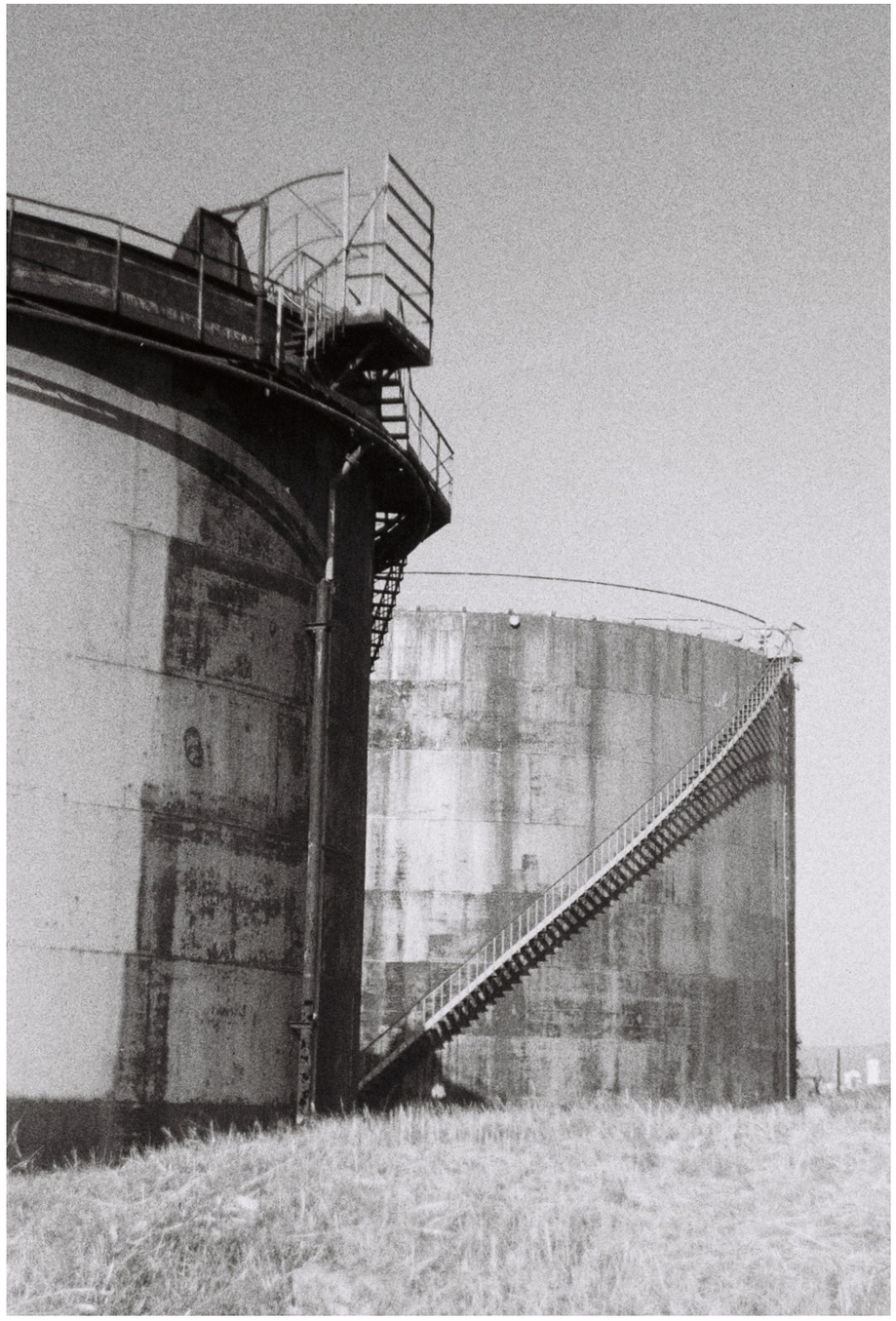
U Oil tank farm
V Illy coffee warehouse
W Veneziani paint factory ˣ
X Aquila oil refinery ˣ

ˣ former



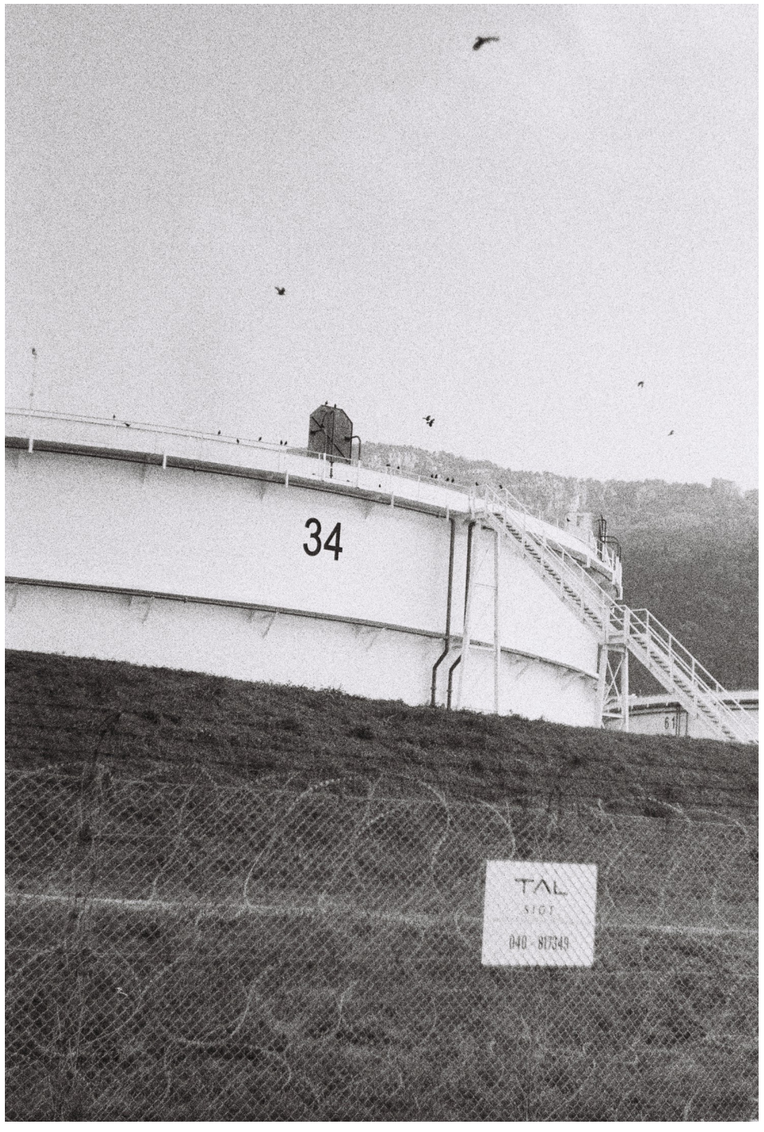
View over the former Aquila oil refinery zone from Via Flavia.

Taken with zenit E (35 mm) in October 2021.



View of the disintegrating oil task of the former Aquila oil refinery from Via Flavia.

Taken with zenit E (35 mm) in October 2021.



View of the oil tank farm in Zona Industriale Est in San Dorligo della Valle.

Taken with zenit E (35 mm) in October 2021.

[20] espresso served in Triestine style—***capo in b***

[19] distributed to Caffè San Marco at Via Cesare Battisti

[18] boxes of labelled canisters are bought back to the warehouse awaiting shipping

[17] during packaging, oxygen is replaced with a mixture of inert gases to preserve the taste

[16] three 15 minute cycles of preheating–drying–roasting-up-to-200°C–cooling and 20 days of maturing in silos

[15] Illy blend is a secret mixture of 9 Arabica beans

[14] coffee sacks are transported on trucks from the warehouse to Illy factory just 2 minutes away, further quality control and testing takes place

[13] Pacorini coffee port service unloads the containers and stores the sacks on the pallets in the warehouse

[12] coffee sorted at Trieste coffee terminal Pier VII

[11] MSC cargo transport unloading

[10] Atlantic—with a stop-over in Barcelona

[9] MSC cargo transport loading

[8] coffee sacks on palettes are loaded into containers

[7] green beans stored in 60 kg polypropylene sacks piled up in warehouses, quality control and testing

[6] mechanical dry milling and removal of the parchment

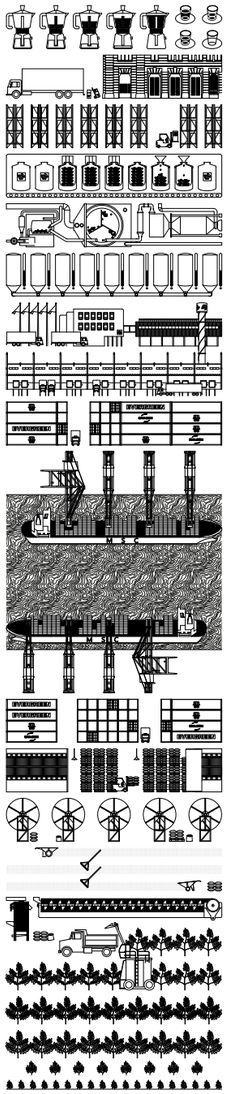
[5] the green beans are sun-dried on large cloths

[4] first selection in a giant sieve using floatation technique, followed by wet processing of the cherries

[3] the harvest by picking or stripping, either manual or mechanical

[2] colour of the cherry changes from green to red

[1] following dry period, plant blooms after an intense rain



III *The New Coffee Road*

As Trieste's industry diminishes, it takes on the role of the transition port of the New Silk Road. The transformation is illustrated in the system of coffee production—historically linked to the former Viennese port. It imagines coffee production as a unidimensional step-by-step process that starts elsewhere at a coffee plantation for the coffee beans to be imported, processed, roasted and distributed from the Illy factory. Trieste is understood as a part of the global network and an integral port terminal for international trade.

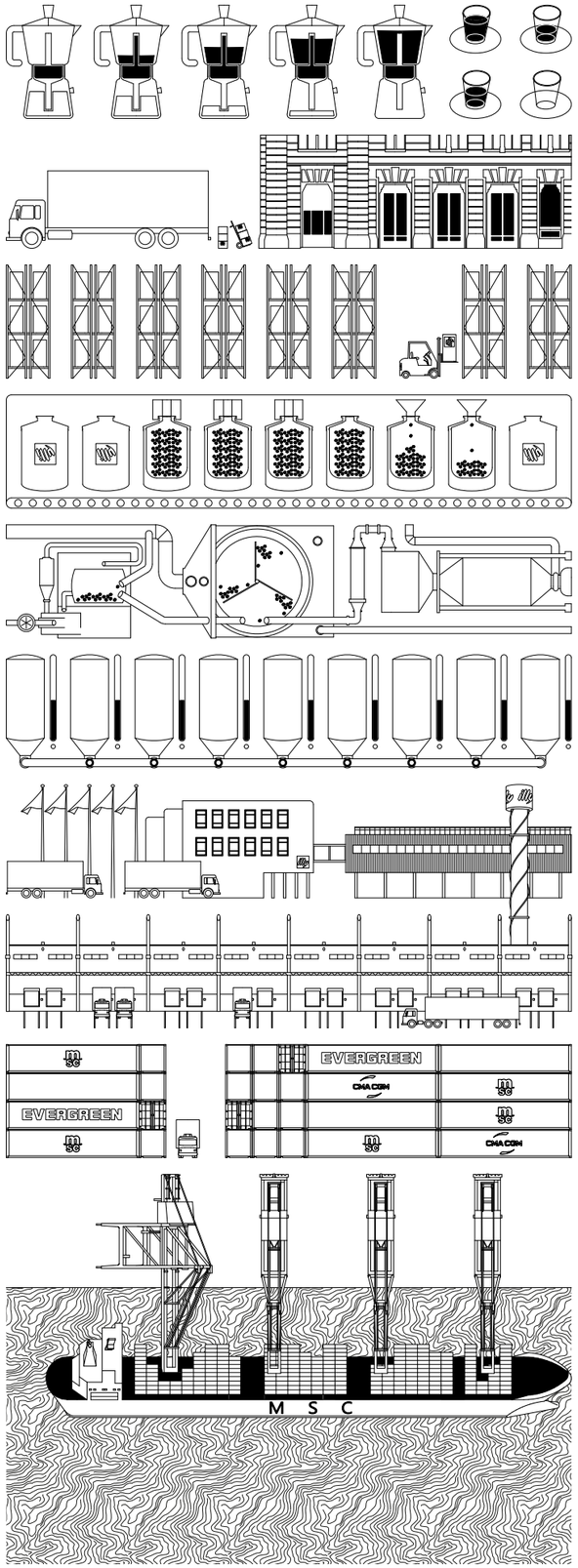
IV *The Value of Coins*

The geopolitical specificity of Trieste is illustrated in an unlikely drawing of an eclectic collection of coins. When functioning as a circulating currency, the ***value*** of a coin is linked to the preconceived economic and social construct of ***money***. A coin, however, has an equally symbolic role linked to iconography—especially concerning commemorative coins.

Listing the currencies recognized as legal tender in Trieste in chronological order tells a linear historical narrative of sovereignty. On the contrary, the eclectic collection of commemorative coins tells a rather complex and nonlinear geopolitical history. Two coins minted almost the same year—one in Vienna, the other in Milan—one celebrating the ***Triestine Italianity***, the other ***Austrianity***—both a part of nationalist propaganda. The paradox introduces the problem of Trieste that was shortly resolved in The Free Territory of Trieste under the direct responsibility of the United Nations Security Council in the aftermath of World War II. For seven years, it acted essentially as a free city.

Hence remains a tendency to speculate on the possibility of a techno-centric micro-state as means to re-establish the social and economic relevance of the city. A design for the micro-state of Trieste's Euro coins was conceived. The iconography portrays Trieste as the ever-expanding terminal port of The New Silk Road and a striving free economic zone.

The design centres on the imagery of cranes as monumental artefacts of the city—a promise of economic progress. In these geopolitical conditions of contested sovereignty and insecurity, obscure or otherwise controversial projects of fundamental research could strive inside peculiar institutions to re-establish the city's presence and identity as a city of knowledge and science.


EVERGREEN
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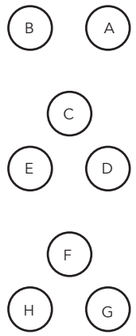


A 2 euro
The lesser known symbol—the melon of Trieste—an *acroterion*, an architectural detail that graced the bell tower of the Cathedral of San Giusto

B 1 euro
The official seal of Trieste—the *Alabarda*— a spear against a red background

C 50 cents
Porto Vecchio

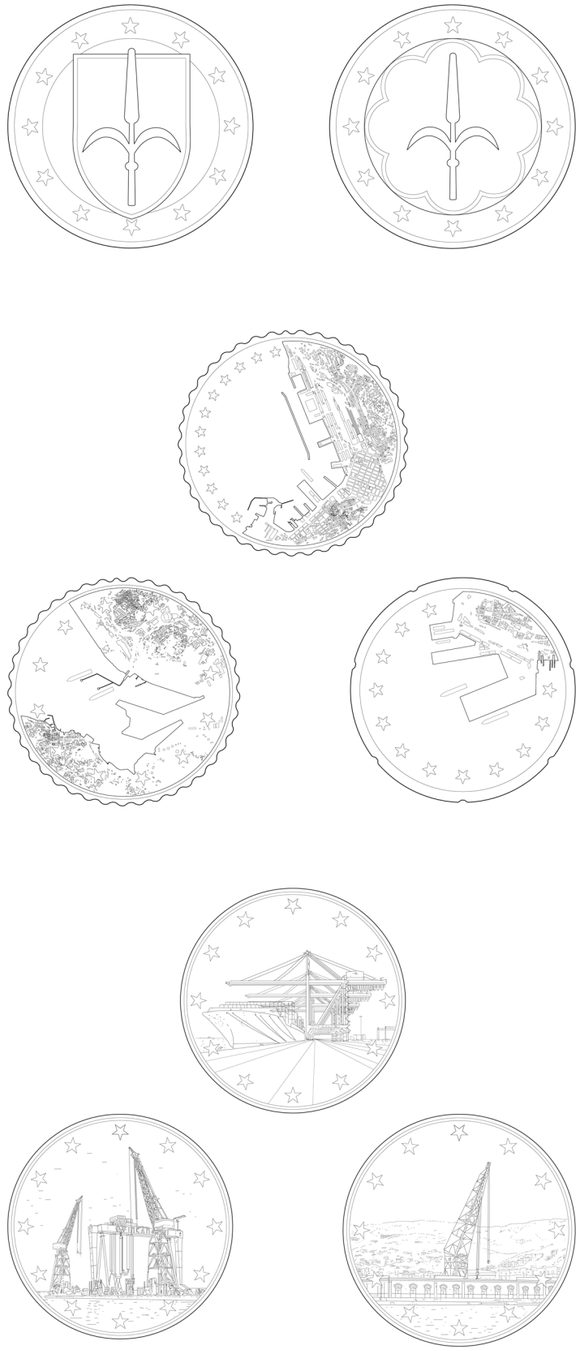
D 20 cents
The industrial marine terminal

E 10 cents
The projected plans of marine terminal expansion

F 5 cents
Industrial cargo cranes at Molo VII

G 2 cents
The ship building cranes in Monfalcone

H 1 cent
Ursus floating crane in Porto Vecchio



[A1] 13th-century Roman coin ***CIVITAS TERGESTVM***
[A2] 1901 Austrian Krone—the official currency of the Austro-Hungarian Empire, from 1892 until its dissolution
[A3] 1922 Italian Lira after the devaluation of Austrian Krone
[A4] 1947-1954 Triestina Lira in paper notes[5] used in Zone B of the Free Territory of Trieste, the short-lived currency was introduced by the Yugoslav military
[A5] 1965 Yugoslav dinar with the emblem ***SFR Yugoslavia***
[A6] 30 cents ***ACEGAT*** municipal company travel token—Italian Social Republic
[A7] 2002 Italian euro coin with the Vitruvian Man

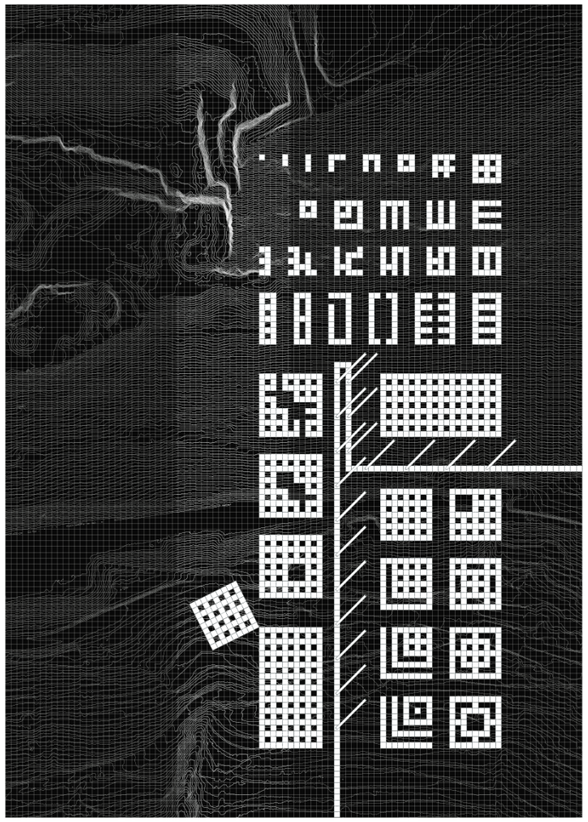
[B1] 1950 coin of the 351st infantry regiment of the Allied Military in Zone A
[B2] 2006 Austrian commemorative 20 euro coin
[B3] 1896 Italian medal to celebrate the manifestation of the ***Italianity*** of the citizens of Trieste for the upcoming elections
[B4] 2006 Austrian commemorative 20 euro coin
[B5] 1914-1918 satirical medal—the obverse[6] features Viktor Emanuel IV. in general's uniform sitting on boxes with an umbrella and binoculars, behind him sits a frog ***"to remember the beautiful view of Trieste"***
[B6] 2007 Austrian commem. 20 coin for the Vienna-Trieste railway
[B7] 1875 medal for inauguration of the Miramar Maximilian monument

[C1] 1938 medal to Trieste from Vittorio Emanuele III—the Venetian lion is featured with the Triestine spear
[C2] 1898 commemorative medal for state constitution for autonomous Trieste
[C3] 1857 Austrian medal to the finance Minister Freiherr von Bruck, the founder of the Austrian Lloyd and Trieste stock exchange
[C4] 1797 Napoleonic medal—the Tagliamento river god gestures the French troops to pass, while the Austrians flee
[C5] 1931 coin for Dr. Theodoro Mayer, the Fascist founder of Il Piccolo
[C6] 1894 Austrian coin in memory of Trieste and Adelsberg—Postojna
[C7] 1872 Franz Joseph medal—500 years of Trieste belonging to Austria

[5] The design for the coin was reproduced based on the existing banknote design.

[6] obverse—the front face of the object—and reverse—the back face. The obverse is commonly called *heads,* because it often depicts the head of a prominent person

The schematic system of the Mine.



V *The Trieste System*

The project builds upon an existing ***Trieste System***—a network of international organisations and institutes related to fundamental science and higher education. The topological diagram maps the existing ***System*** and its global outreach in which the concentric circles organise the institutes in reference to the built environment and its infrastructure.

What is equally of concern is under which conditions they operate. The EU and Italy have their own rules and regulations—and bureaucracy—which sets their limitations on scientific research, such as the inability to continue experimental nuclear research on Italian territory. The project suggests an intervention into the ***System***—whether to unify or disrupt it.

VI *The Geology of an Experiment*

The choice of the site is the former quarries of Trieste. It is the site where the forces of entropy—both social and natural—worked to dissolve the landscape. The project is understood as a natural continuation of these processes. A lino print of abstracted topography (see previous page) accentuates the contrast between the steep hillside and a plateau into which the entropic void of the quarry has been carved out, and an underground artificial tunnel has been excavated.

The phenomenon of obsolescence is not limited to postindustrial landscapes but rather concerns a broad conception of sites of production, including the production of knowledge. The argumentation for the thematic component of fundamental research is based on the conception that obscure or controversial ideas could strive in the context of Trieste precisely because of its geopolitical condition.

Territorialising the Experiment consisted of projecting the geometry onto a changing abstract landscape and then juxtaposing it on the actual site in question—the former quarries in Trieste. A plateau allows for extensive underground excavation to continue the entropic processes in the landscape.

The site drawing speculates an experiment that takes on a territorial scale. Its architecture is expressed in the auxiliary facilities organised along a linear path centred to the circular infrastructure of the experiment and continues in between the two quarries. The facilities—the laboratory and the research centre—stand in opposition on each side. The cycle of obsolescence is suggested in an already obsolete experimental space that then acts as land art.

[1] innermost circle—6 major institutes in Trieste

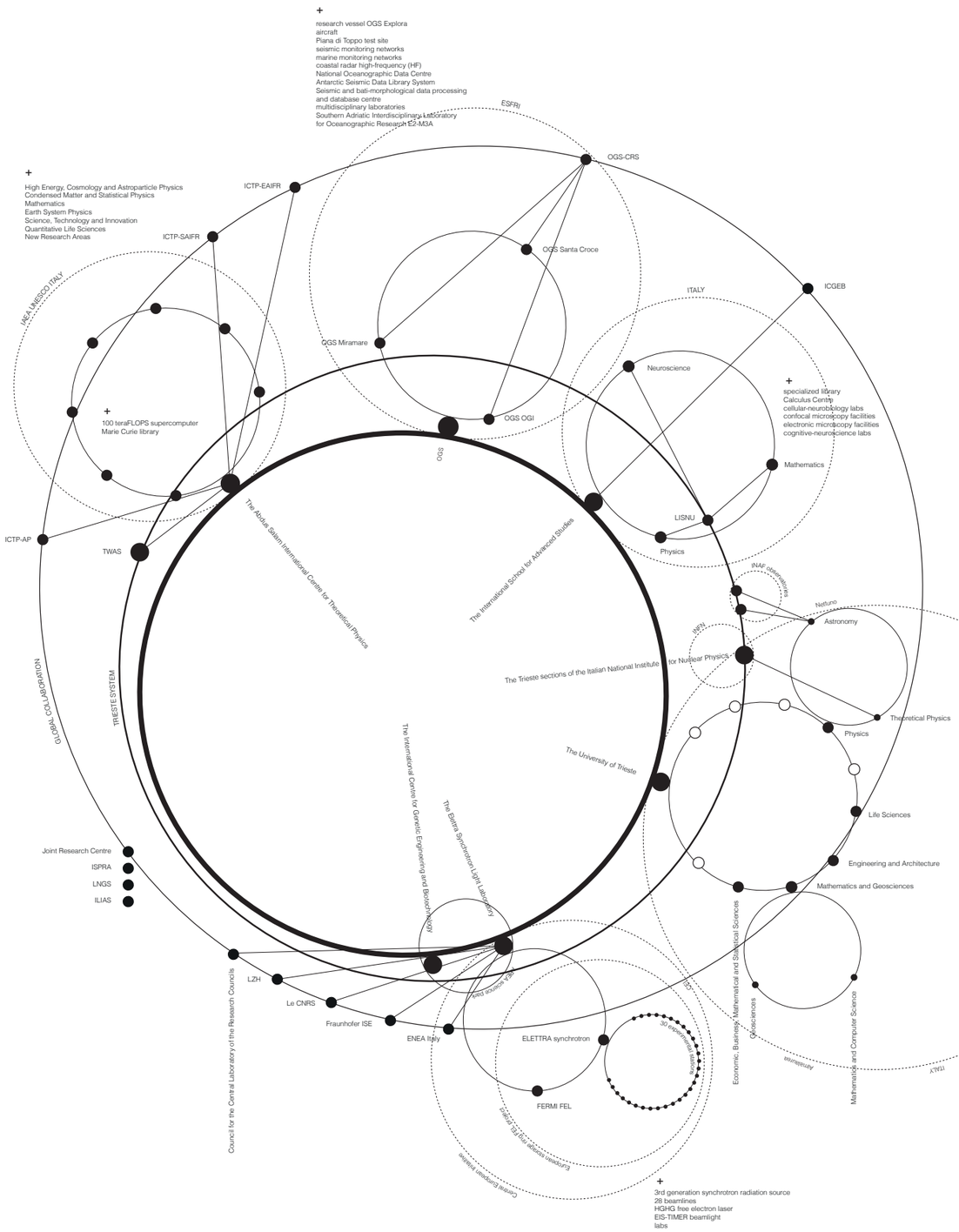
[2] mid-circle—related infrastructure, secondary institutes and branches of Italian or international institutes in Trieste

[3] outermost circle—collaborating instities outside of Trieste

[4] subdivisions of the major institute (e.g. departments)

[5] overlooking organisations

\+ existent infrastructure and technology



A_{EXP} territory of the experiment
AL an auxiliary laboratory facility, underground
RC public research centre

Q_A, Q_B former quarries as entropic voids in landscape
O_{EXP} the territory of an obsolete experiment
P_{ACC} access pointunderground highway tunnel

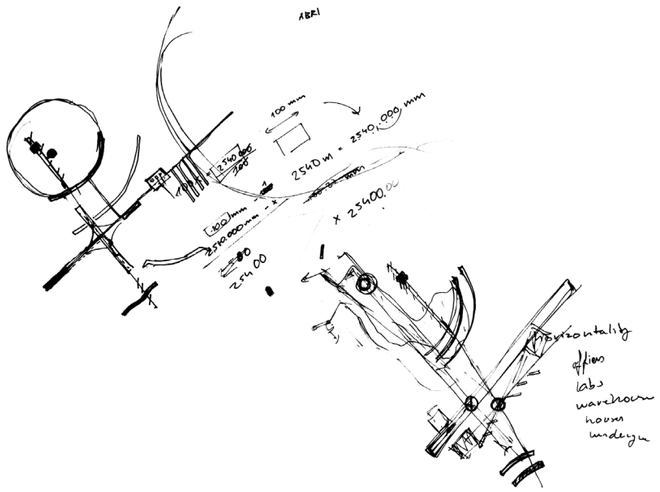
The entropic void of the former quarry—project site.

A lino print
(148 x 210mm)

The fundamental scientific inquiry and the experiment.

A lino print
(148 x 210mm)

Early sketch made during conceptualising the project.



VII *The Control Room*

Equally relevant to the space of the experiment is the space for the human—operator and spectator of the experiment—illustrated by a fundamental part of the design, the control room. What is of interest is the room's design and the physically direct or indirect spatial relation to the experiment's space via the ***hyperreal space*** of the series of operational screens and control walls that run the system and record the results compiled as raw data in an ever-expanding tape library to be analysed and interpreted.

The portrayed control room was inspired by the design of the 1970s electrical control room at CERN and the geometry of the ***Mundaneum***. As conceived by Paul Otlet and Henri La Fontaine, ***Mundaneum*** synthesised the need to concentrate all human knowledge in a single, accessible place and the capacity to provide an efficient system to remotely and effectively retrieve all of this information. The precursor of network-based knowledge systems and of the Internet itself.

VIII *The BIG SCIENCE*

The difficult whole addresses the spatial concerns of Big Science—the fast-paced accumulation and specialisation of knowledge, the projected obsolescence of the experiment on a territorial scale, the lack of communication and the weakening connection of science to philosophy and the arts.

The architecture is argued to be a relevant space where preconceived tensions between ***progress—obsolescence—disaster*** could play out productively. The conception of the Independent Research Centre for Scientific Failures is an attempt to question how an institution that materialises fundamental scientific inquiry at the intersection with philosophy could be conceived.

The outlined themes have the potential to dive into architecturally little-theorised spaces of the experiment and the laboratory that surprisingly reveals new narratives about what it means to exist in contemporary society and the architecture's place in modern science.

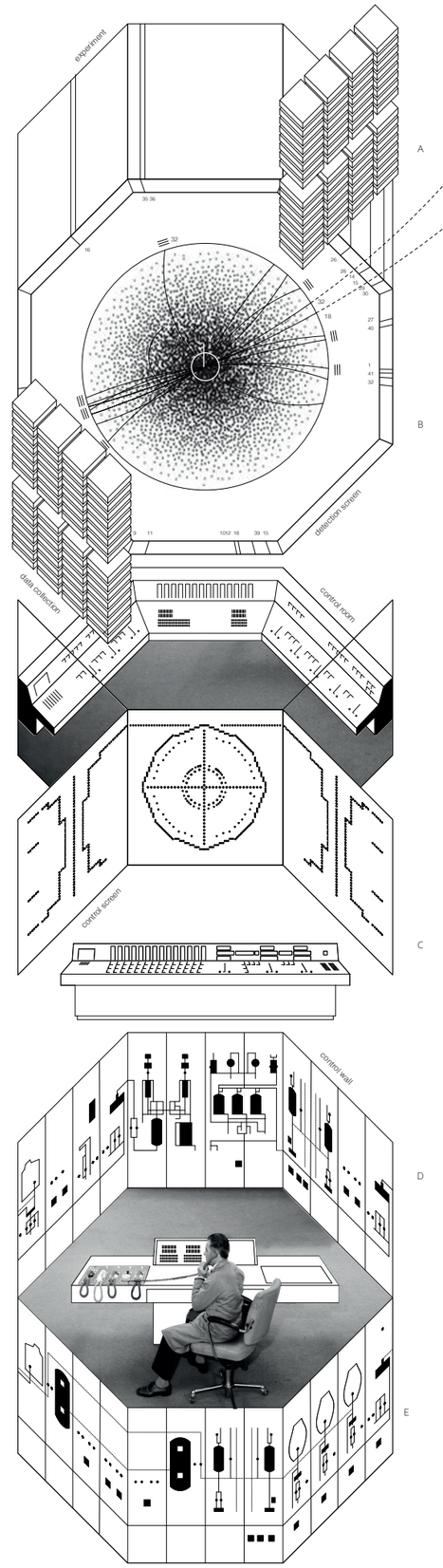
[A] the tape libraries at the lab's Feynman Computing Center at Fermilab, 2020

[B] the fifth Z-event observed at the Linear Collider, an unseen Z decays into an unseen quark-antiquark pair, at the Stanford Linear Accelerator Centre, 1989

[C] the control screen of a particle collider, CERN, c. 1970

[D] the electricity control room, CERN headquarters, c. 1970

[E] geometry of the *Mundaneum* by Paul Otlet and Henri La Fontaine, c. 1930



[1] The architecture of ***Anatomical Theatre***, the communication and education through a scientific experiment

[2] The Standard Model of Particle Physics

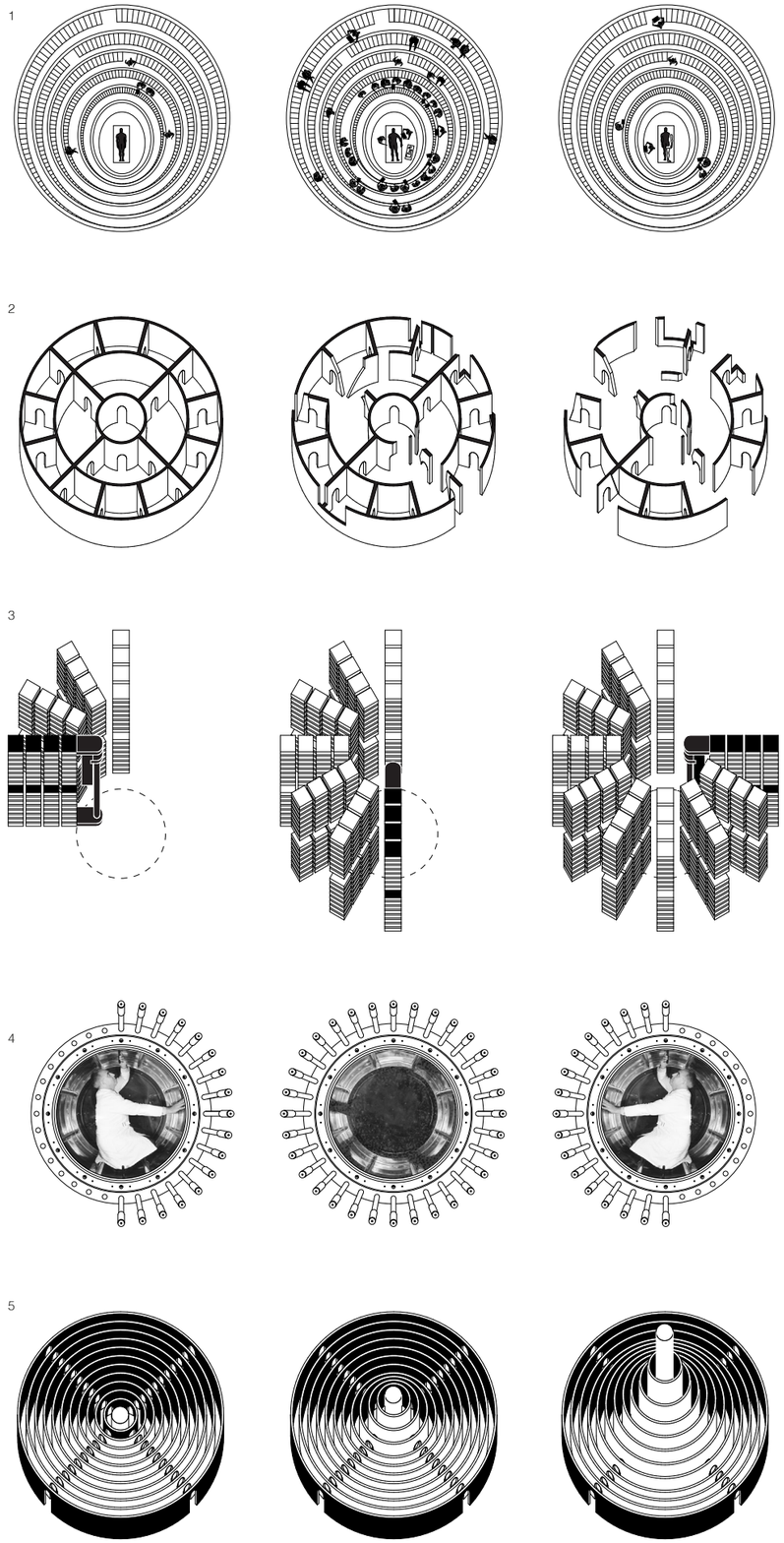
"Today nearly all of particle physics is focused on finding a crack, any crack, in its relentless edifice."

Jonathan Link, 2018

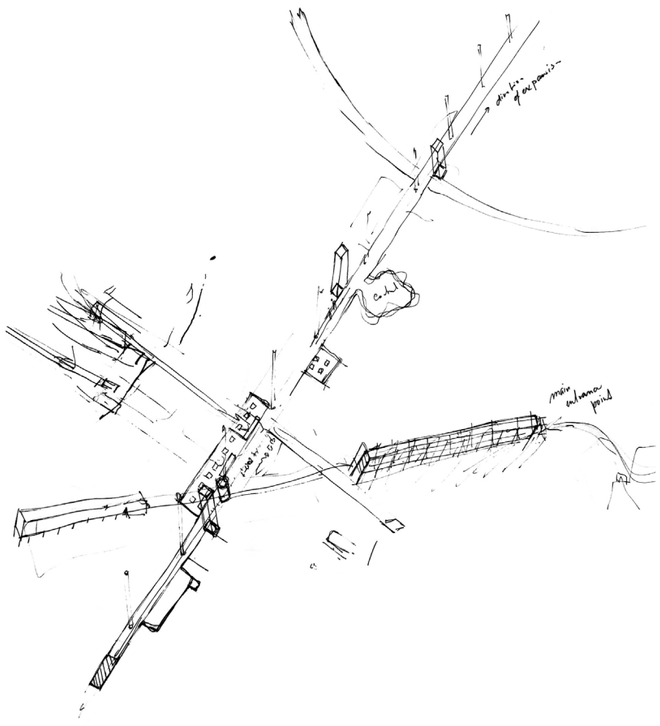
[3] The tape silo, the half-life and obsolescence of the scientific literature and the hoarding of data

[4] Assembly and disassembly of a Bubble Chamber at CERN, 1969, a now-obsolete technology of particle detection

[5] Tommaso Campanella's techno-utopia ***The City of the Sun*** On the twelve concentric walls of the city was inscribed what he understood to be all knowledge.



Early sketch made during conceptualising the project.

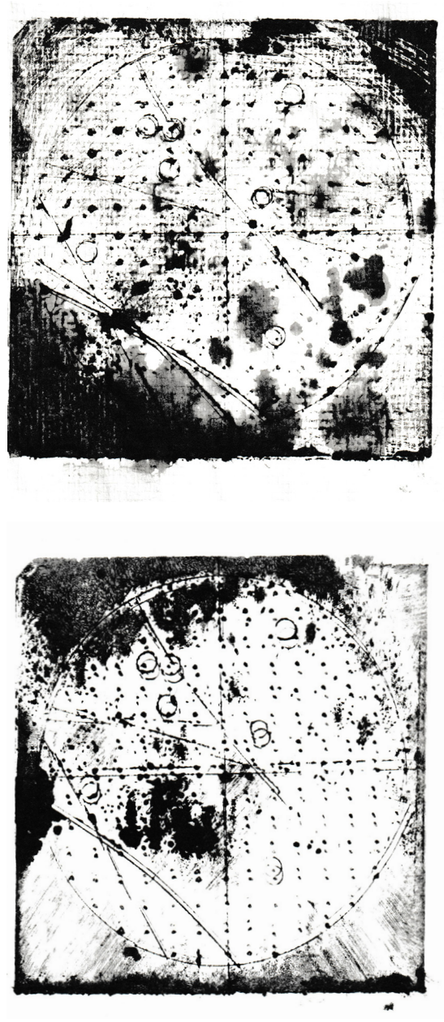


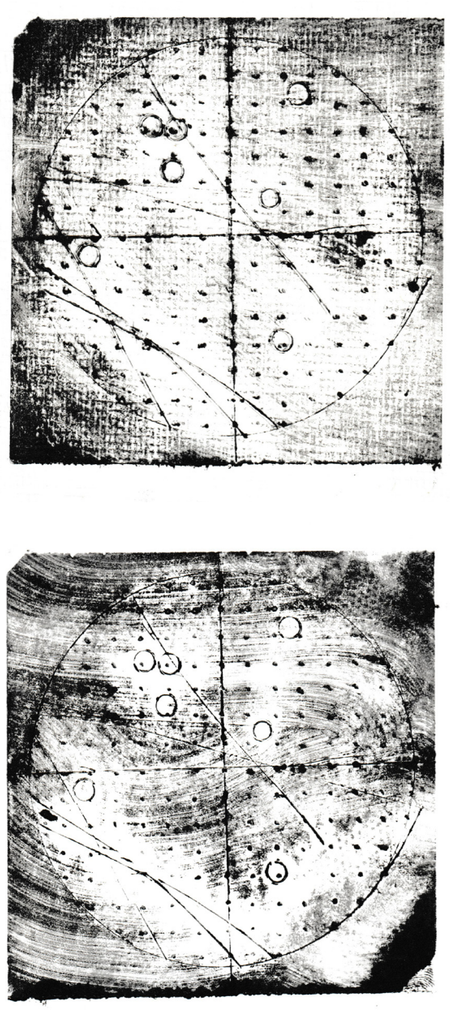
IX *Territorialising an Experiment*

The nature of practising science has drastically changed within several decades. WWII and Cold War-era militarisation of science and industrialisation of scientific processes resulted in a shift from the gendered image of a lone genius inside a remote laboratory to what is now called the Big Science. The spatial concerns of Big Science regard its core principles of collaborative supranational effort, micro-regions of concentrated specialised knowledge and experiments that require a territorial scale.

"It is curious that to examine the smallest details of nature, the largest instruments must be used."[7] At the core of the Modi Operandi workshop is the notion of the experiment as an inherent part of scientific inquiry.

[7] Wilson, R., 1999. 'Architecture at Fermilab' in Galison, P., & Jones, C. A., (ed.) 1999. *The Architecture of Science.* London: The MIT Press.





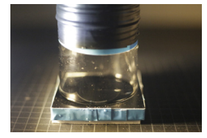
Cloud chamber experiment's results recorded in a series of dry needle etchings.

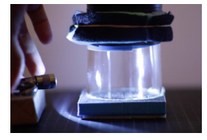
The invention of a cloud chamber marked the beginning of modern particle physics. A cloud chamber is a particle detector used for visualising the passage of ionising radiation inside a sealed environment containing a supersaturated vapour of alcohol. A charged particle interacts with the gas by knocking electrons off gas molecules resulting in a trail of ionised gas particles which creates a mist-like trail of droplets—a cloud track. In the ephemeral act of detecting the invisible, the particles—otherwise passive omnipresent elements—become the acting agents inside the experiment.

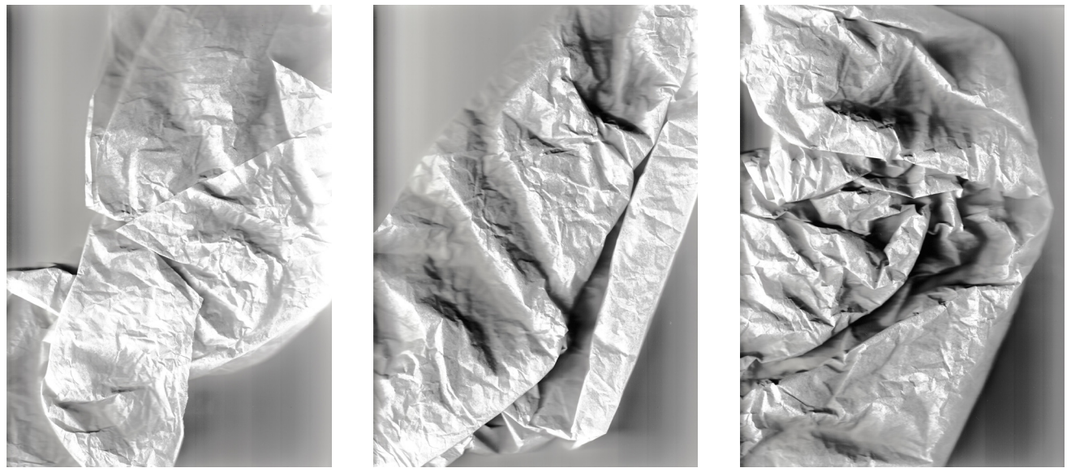
For the Modi Operandi workshop, a simple cloud chamber was constructed using an aluminium heat sink filled with cooling gel frozen overnight to -15 °C. A glass container fitted with felt soaked in concentrated isopropylene alcohol was placed over the heat sink, and a metal container filled with boiling water was placed on top of it.[8] The temperature difference allowed the glass container to be soon filled with supersaturated alcohol vapour—hence the name cloud chamber as it appears to contain a light cloud or a descending mist.

The experiment was conducted multiple times in a dark room with only a single source of direct light passing through a narrow slit that allows for observation of collisions. A high-resolution camera was set up to record the up-to-15 minutes' long sessions. After some time, all alcohol descents and the mist becomes too thin to observe. Afterwards, the results caught on camera were recorded in a series of dry needle etchings.

8





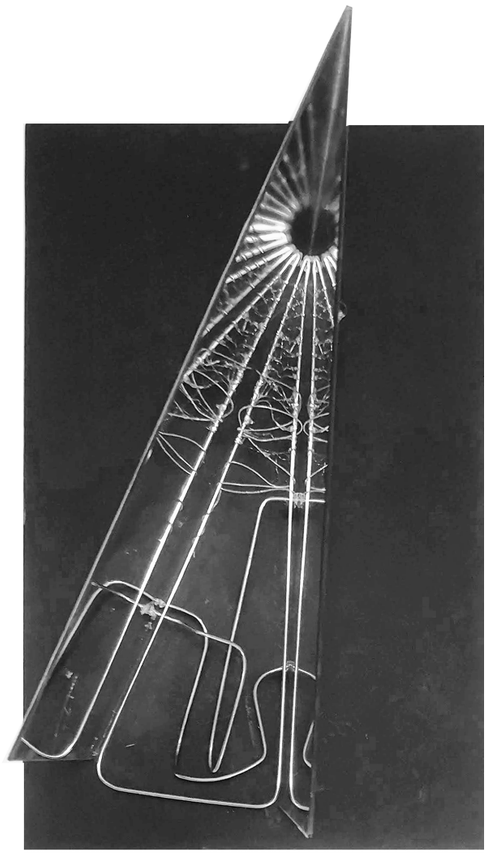


First attempts on territorialising an experiment made during Modi Operandi workshop.

[medium—scans of tracing paper]

First attempts on territorialising an experiment made during Modi Operandi workshop.

[medium—scans of tracing paper juxtaposed with lino prints]



The critical space of the experiment enclosed within the two mirrors creates an illusion of infinite space.

The critical space of the experiment is examined through the repeated process of melting and casting a soft metal tin (Sn-50). After solidifying, pure tin presents a silvery mirror-like appearance—enclosed between two mirrors, it implies an infinitely large space. The model explores critical space as a one-twelfth of the polygonal geometry omnipresent in reference to ***Big Science***—famously in the image of LHC at CERN. The model suggests a hidden mass that is only perceivable at a particular angle and otherwise remains unseen.

Pure tin solder bars were melted inside a steel pot with a higher melting point to contain the 232 °C liquid metal. A polyester mould covered in an aluminium foil was formed inside a steel container that had been filled with cool water up to 1 cm in depth. The result, once poured, is a mirror-like cast tin solid with a crater-ridden moon-like surface due to the instant cooling of tin in water. In addition, droplets of solidified tin were formed. The tin was then melted, and the process was repeated.[9]

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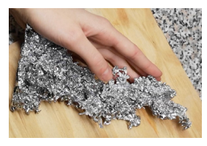
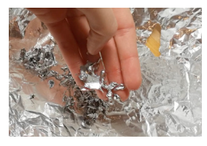
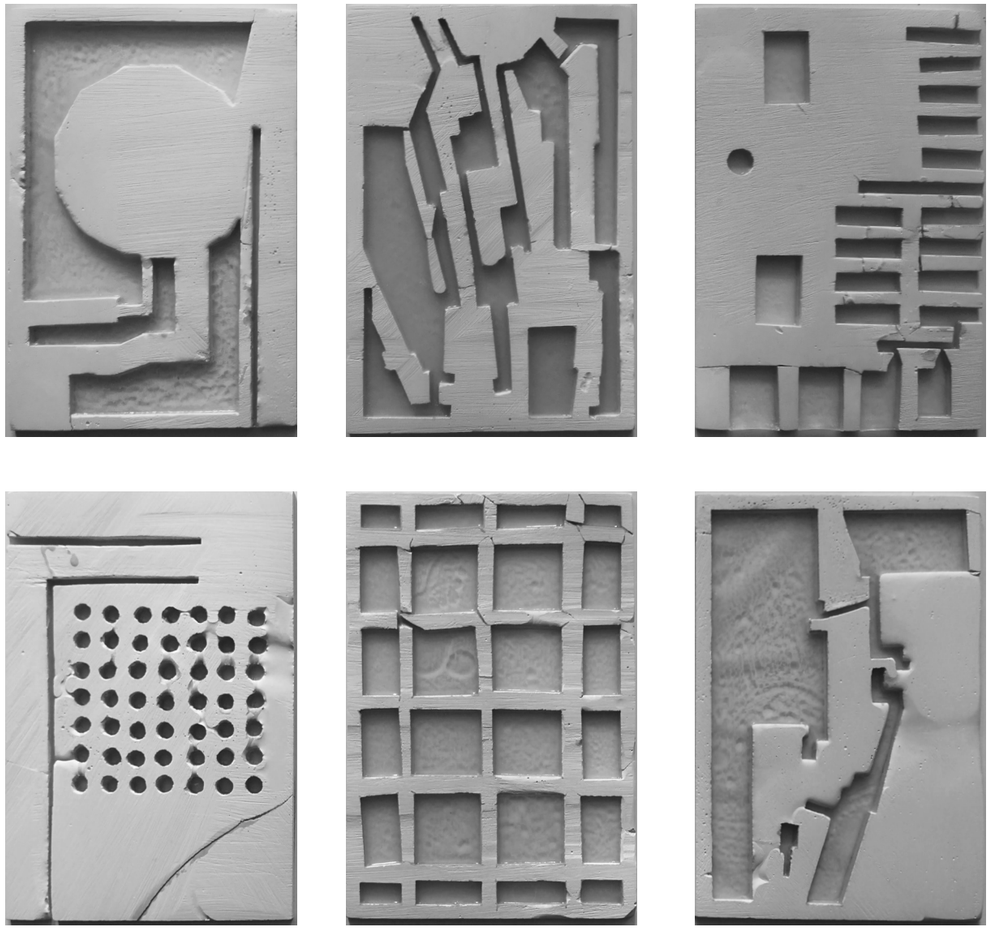






Abstractions of experiments'. [From top left—bottom right] Muon g-2 at Fermilab, linear collider at CERN, data processing set at CERN, graphite reactor at Oak Ridge, and DUNE Deep Underground Neutrino Experiment at Fermilab.

Through the abstraction of the layouts—plans and facades—of now obsolete experiments, the negative space is visualised—the poché now counterintuitively refers to the space for architecture. The experiment's space is cast into a foam mould with gypsum, fracturing during the demolding for the in-between to be filled with translucent epoxy—effectively creating a series of stained windows reminiscent of deconstructivist spaces.[10]

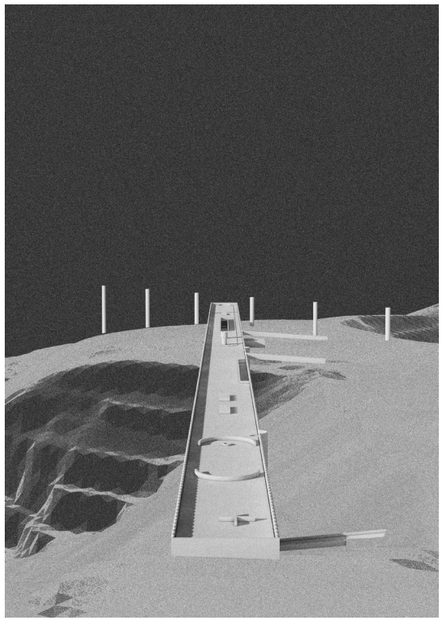
The fracturing here (somewhat loosely) refers to the notions of accident and disaster as introduced by Paul Virilio in University of Disaster [11] and Unknown Quantity.[12] Virilio understood scientific progress and disaster as two sides of the same coin—the accident reveals the substance, the invention of substance is equally an invention of the accident. These notions effectively form the theoretical basis of the project.

[11] Virilio, P., 2009. *University of Disaster.* Wiley.

[12] Virilio, P., 2002. *Unknown Quantity.* Paris: The Fondation Cartier pour l'art contemporain, Thames & Hudson.

10

View of the institute in a longitudinal direction.



X *ABRI*

A fascination with obsolescence as an inherent landscape condition lies at the core of a project that thematically focuses on fundamental scientific inquiry in reference to the ***Big Science***. It stems from the preconceived tensions between the notions of ***progress versus obsolescence*** and ***progress versus accident***.

The former is a result of the latent dependency of economic progress on the perpetual obsolescence of space, as is argued in the theory paper entitled ***Territories in Obsolescence***. And the latter is a controversion that scientific progress and technocentric accident are two sides of the same coin, as the philosopher Paul Virilio argued in his ***University of Disaster***.[13] The theory provides a critical understanding of the scientific experiment and introduces the counter notions of ***accident*** and ***disaster***.

The project is centred on the need to contain scientific progress architecturally inside micro-regions of concentrated knowledge production and satisfy the territorial concerns of the ***Big Science*** that—more often than not—take on an infrastructural scale. It addresses these themes in Trieste—a territory of contested history and sovereignty once envisioned as the city of science and knowledge.

The project concerns the conception and the design of ***Anatoli Bugorski Independent Research Institute for Scientific Failures*** which inhabits a post-industrial landscape of the former cement quarries that allow for sustaining such an institution. That is both materially and conceptually by providing the underground territory for experimentation and the primary structural material.

The project speculates r***eversing re-naturalisation*** processes and excavating the underground spaces by employing the room and pillar dogmatic mining method superimposed upon the critically unstable conditions of the Karstic terrain. Here, the notions of accident and disaster materialise within the post-industrial landscape.

[13] Virilio, P., 2009. *University of Disaster.* Wiley.

Virilio, P., 2002. *Unknown Quantity.* Paris: The Fondation Cartier pour l'art contemporain, Thames & Hudson.

The project is speculation on intervention into the existing ***Trieste System***—a network of international organisations and institutes for fundamental research. Hence the project title ***Archipelago of Wonders*** is based on the autobiography of the same name by the theoretical physicist Paolo Budinich.[14] Budinich—a proponent of the reunification of Science and Philosophy—argued Trieste should play a significant role in fundamental research on an international scale. The ***archipelago*** in the title refers to these institutes' collaborative network.

[14] Budinich, P., 2000. *L'arcipelago delle meraviglie.* Milano: Di Renzo.

The contribution to the System is the conception and design of ***Anatoli Bugorski Independent Research Institute for Scientific Failures***, named after a Russian particle physicist and the only known survivor of a radiation accident when a high-energy proton beam passed his brain inside an accelerator.

"The accident happened at the Institute for High Energy Physics in Protvino—one of the 60 science boomtowns that sprung up as part of the grand experiment of the Soviet Union in pursuit of superpower status. Then 36-year-old particle physics researcher Anatoli Bugorski was asked to check a piece of accelerator equipment that had malfunctioned.

As had several safety mechanisms that day in 1978. The control room was supposed to have removed the high-energy proton beam from the state-of-the-art particle accelerator, the U-70 synchrotron that needed a fix. The doors to the experiment should have been locked. The light signalling danger should have been lit. Hesitantly, Bugorski entered the experiment.

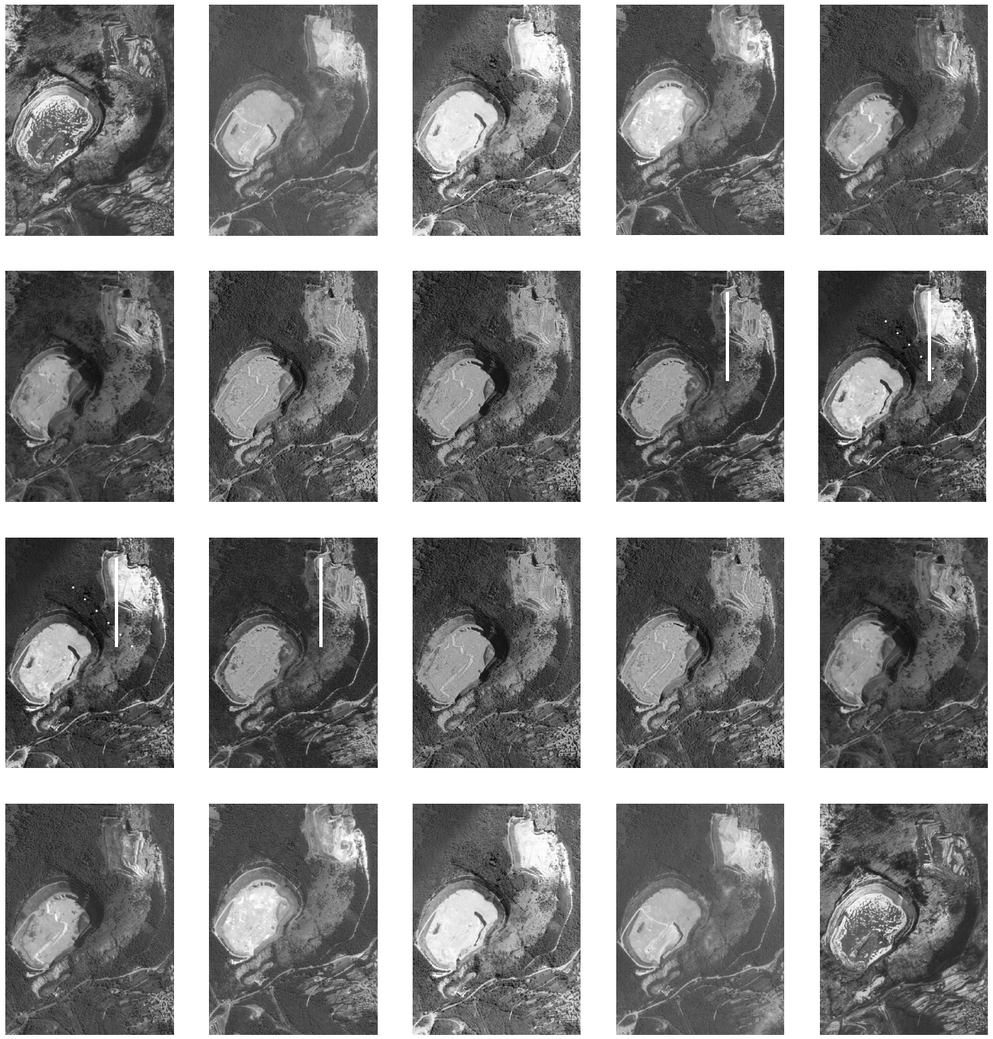
Leaning over the piece of equipment, he stuck his head in the space through which —unbeknown to the scientist—the 76 GeV proton beam was still passing. Bugorski saw a flash "brighter than a thousand suns." The proton beam that entered Anatoli Bugorski's skull measured 200,000 rads, and when it exited, having collided with the inside of his head, it weighed in at 300,000 rads. He felt no pain..." [15]

[15] ABRI Newsletter.

The story of incompetent bureaucracy and the failed science boomtowns of the Soviet Union illustrates just how geopolitically charged the infrastructure and architecture of fundamental research are.[16] As an Iron Curtain frontier, Trieste provided a rare line of communication between scientists from the East and West during the Cold War era, allowing for productive—but controversial—permeation of knowledge.

[16] Gessen, M., 1997. 'The Future Ruins of the Nuclear Age' in *Wired* [online]. Available at: wired.com/1997/12/science-2/ (June 10 2022).

Map of the heterogeneous geology of the Adriatic coast illustrates the characteristic unstable Karstic terrain. The chemical dissolution of limestone by percolating acidic groundwater containing dissolved carbon dioxide results in the formation of solution features—cave systems, sinkholes and negative relief landforms. The institute is situated within such a landscape as it inhabits former surface quarries for cement production, which have been undergoing the contested process of ***re-naturalisation***. The project is conceptualised as a



Exercise in Entropy. Gradual disintegration of the limestone quarries. [source: Google Earth]

system in which the ***re-naturalisation*** is reversed, and the quarrying process is continued in an underground mine. No longer for maximum material extraction but as means to excavate underground spaces for fundamental scientific inquiry—effectively enforcing the anthropogenic landscape and counter-acting ***(our)*** understanding of obsolescence.

The system employs the room and pillar underground mining based upon a multi-level horizontal drill-and-blast extraction methodology. The excavation process is imposed on the critically unstable condition of the terrain. The dogmatic geometry of the chequered excavation is confronted with the chemical and physical rock properties—enforcing exceptions and adaptations in the process that addresses the critically unstable nature of the post-industrial territory. The system is conceptualised as a continuous process of drill and blast operations according to the arising needs of the institute—excavating new and abandoning the obsolete and collapsed rooms. In that, the ***Mine***—the territory for experimentation is of endless potential for expansion—except for when juxtaposed with the physical uncertainty of the landscape. The physical reality of the accident.

The central tunnels determine the spine of the ***Mine***—the linearity of which is readable in the landscape through extruded ventilation shafts. The chequered pattern is then excavated according to the unpredictable needs of the experiments. The extracted limestone is crushed into aggregate and processed into lime-based shotcrete, concrete and limecrete on-site within an inert material processing plant. Effectively providing the core building material for the institute and enclosing the material loop within the project.

The volume of the institute is levelled with the heigh at the West edge of the quarry, yet it introduces its own topographical line, which makes the gentle sloping of the landscape more evident. The form runs parallel to the artificial edge of the Pietra Scoria quarry—resulting in a predominantly North-South orientation of the building. The roof level effectively takes on the role of the ground level and serves as the primary means of circulation through the half-kilometre-long structure. It is connected to the landscape by ramps suspended above the steep slopes' edge.

The program of the levels below is determined by the structure's interaction with the changing height level of the terrain—combining workspaces with housing for the collective of scientists—studios for resident scientists in the West wing and tenure apartments in the East wing. The changing topography allows for multiple access points at different levels, distinguishing between ramps and drive-thrus.

Three distinct territorial conditions can be identified in the transversal sections—spanning the Pietra Scoria quarry, crossing the landscape, and a section within the Bosco Bazzoni. The first is overlooking the steep slopes of the former cement quarry, shielded by the exposed stone face from one side. The circulation is pushed towards the protected Northside. At the same time, the programme overlooks the natural reserve Bagnoli della Rosandra and the oil tank farm in Zona Industriale Est in its proximity. The second cross passes the landscape underground with the roof level just two metres above the terrain. Once exiting the limestone landscape, the structure opens towards both sides into the third territorial condition with a gentler slope overlooking Trieste and its industrial port. Here circulation is centralised, allowing the programme to span the width of the building.

Similarly to the inherent logic of the ***Mine***, which is based on a dogmatic system that allows for exceptions to the unstable landscape—the structural integrity of the building relies on the adaptability of a rigid grid. At 10 metres span, the primary structure comprises composite columns that come down to load-bearing walls cast in lime-based concrete. The exceptions include cast-on-site pillars of varying forms linked to their stability function and role as containers for the programme. The top two levels comprise precast vaulted limecrete panels in combination with steel beams. The bottom two levels of the concrete waffle slab, in combination with load-bearing walls, ensure the stability of the structure. Due to the exceptional length, the building comprises dilatations incorporated into the building by means of doubling structural elements—each time signalling a change of function along the longitudinal span.

The foundations become integral to the structure and the conceptual understanding of an intervention into the critically unstable Karstic terrain containing potentially hazardous solution features. Micropiles for the deep foundation, which have been proven successful in the complex Karstic conditions, are utilised in combination with foundation treatment of filling cavities by grouting and strengthening the bedrock. An alternative approach is suggested in the ***appendix*** of the project. One that relies less on the physical strengthening of the critically unstable limestone base and instead embraces its unpredictable heterogeneity. In this approach, once the bearing capacity is analysed by drilling probe holes and test loading, the rigid load-bearing structure is adapted to the best physical loading capacity of the terrain. This results in a highly irregular form.

The physicist and sculptor Robert Wilson, former director of the Fermilab project, argued that while the lab's success is based entirely on the quality of the research, the difference between success and failure equally depends on ***"good architecture"***.[17] The ABRI institute is a project that saturates itself with complex themes and does not necessarily mean to resolve them. Instead, superimposing them allows itself to question and explore the margins of architecture. When confronted with the notions of obsolescence and disaster, the themes of scientific inquiry and technocentric progress have the potential to dive into architecturally little-theorised spaces that surprisingly reveal new narratives about what it means to inquire and what is the architecture's place in it.

[17] Wilson, R., 1999. 'Architecture at Fermilab' in Galison, P., & Jones, C. A., (ed.) 1999. *The Architecture of Science.* London: The MIT Press.

Bibliography

Borders&Territories' graduation studio, 2022. ***The Others' Trieste.***

Budinich, P., 2000. ***L'arcipelago delle meraviglie.*** Milano: Di Renzo.

Galison, P., & Hevly, B., (ed.) 1992. ***Big Science, The Growth of Large-Scale Research.*** Stanford: Stanford University Press.

Galison, P., & Jones, C. A., (ed.) 1999. ***The Architecture of Science.*** London: The MIT Press.

Gessen, M., 1997. 'The Future Ruins of the Nuclear Age' in ***Wired*** [online]. Available at: wired.com/1997/12/science-2/
(June 10 2022).

Gooding, D., Pinch, T., & Schaffer, S., (ed.) 1993 [1989]. ***The uses of experiment. Studies in the natural sciences.*** Cambridge: Cambridge University Press.

Hametz, M., 2005. ***Making Trieste Italian, 1918-1954.*** London: The Royal Historical Society.

Morris, J., 2002. ***Trieste And The Meaning Of Nowhere.*** Da Capo Press.

Virilio, P., 2009. ***University of Disaster.*** Wiley.

Virilio, P., 2002. ***Unknown Quantity.*** Paris: The Fondation Cartier pour l'art contemporain, Thames & Hudson.

Archipelago of Wonders

Transient Liquidities along the New Silk Road

MSc4 Borders&Territories graduation studio
Transient Liquidities along the New Silk Road
Theory paper by Dominika Kopiarová

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