Linear Mirror and Isomorph Gasifier as possible elements of a Porto Vecchio Culture

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Presentation at FIT

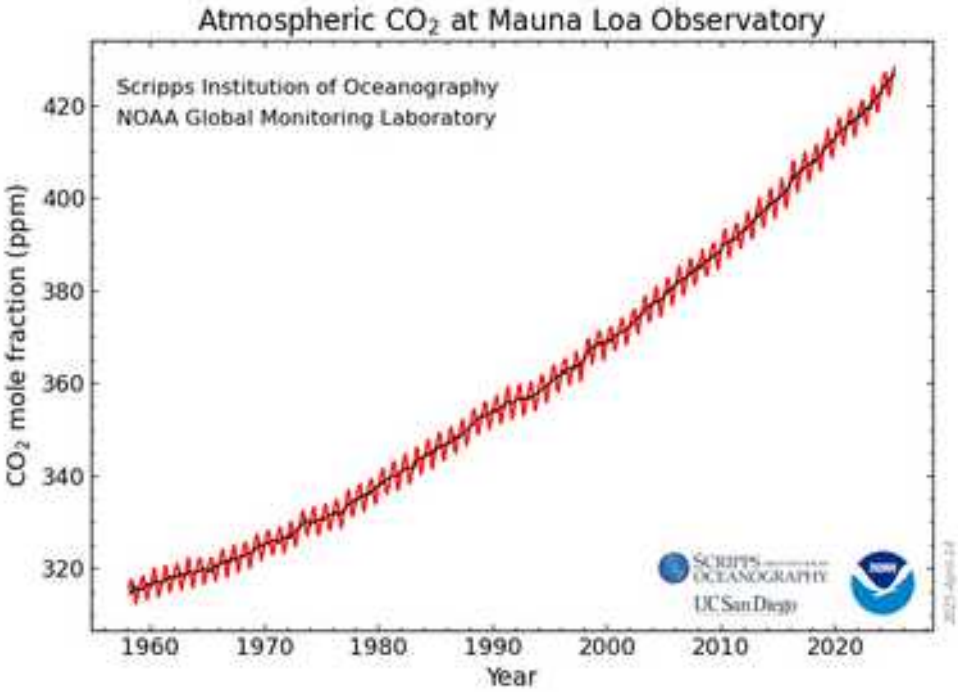
The biggest problem of our time is global heating caused by the steady increase of CO_2.

Evidently, traditional technologies are not able to solve the problem, new techniques are needed.

But for the last 30 years, there have been no new technologies.

Has science come to its end?
Has physics finished?

or are there alternative explanations?



1) alternative explanation:

in our times:
Past = retro = old fashioned = simple = outdated ...
= contrary of future

Progress in the fight against CO_2 is to emerge
from heavily controlled organized science,
separated from the rest of culture,
and without links to the past

Maybe we should consider:

1) fundamental innovation can come only from the human being, not from machines.

2) the human being participates at two forms of live:

a) organic live = 80% water

b) intellectual live = 99% past

(1)+(2b) => need to reconnect to the past (=culture) in order to create future ?

studies of human beings who grew up without past: Kaspar Hauser children, WHO ICD-10: F94.1, F94.2

2) Porto Vecchio Culture

Trieste was one of the most advanced technological centers in the world. Like in a time capsule, that technology has been conserved at Porto Vecchio.

The persons and organizations who are reconstructing Porto Vecchio are indeed reconnecting to the past culture in order to create future.

Let us call this new paradigm
– creating the future from the past (culture) :
“Porto Vecchio Culture”.

Scientific experiment:

what happens,
if we apply the Porto Vecchio approach to the CO_2 problem ?

re-connecting to the past means :

1) improve what was good.

2) consider also what was bad in order to avoid repeating it.

Do not cancel.

3) Solar Energy

The major source of renewable energy is photovoltaics, PV.

- provided only when the sun is shining
- can be stored only in small quantities.

=> PV alone cannot stop CO_2 increase.

=> PV is good,
but the fact that we have little else, is bad

PV is not produced in Italy/EU anymore

Necessary additional solar technologies were suggested:

parabolic mirrors

for example

Kramer Junction (USA),

Ouarzazate (Marocco)

Many billions of dollars spent,
technology by now considered obsolete

Caveja Nord srl, **Udine Solar** **30 milion Euro.**

chiesta in Regione la valutazione di impatto ambientale

La struttura è frutto di un brevetto del premio Nobel Carlo Rubbia

di Giacomina Pellizzari

A CUSSIGNACCO

Al posto della discarica una centrale solare

Il consorzio Caveja investe 30 milioni per realizzare il progetto a Modoletto
L'obiettivo è produrre energia elettrica con un sistema di specchi parabolici

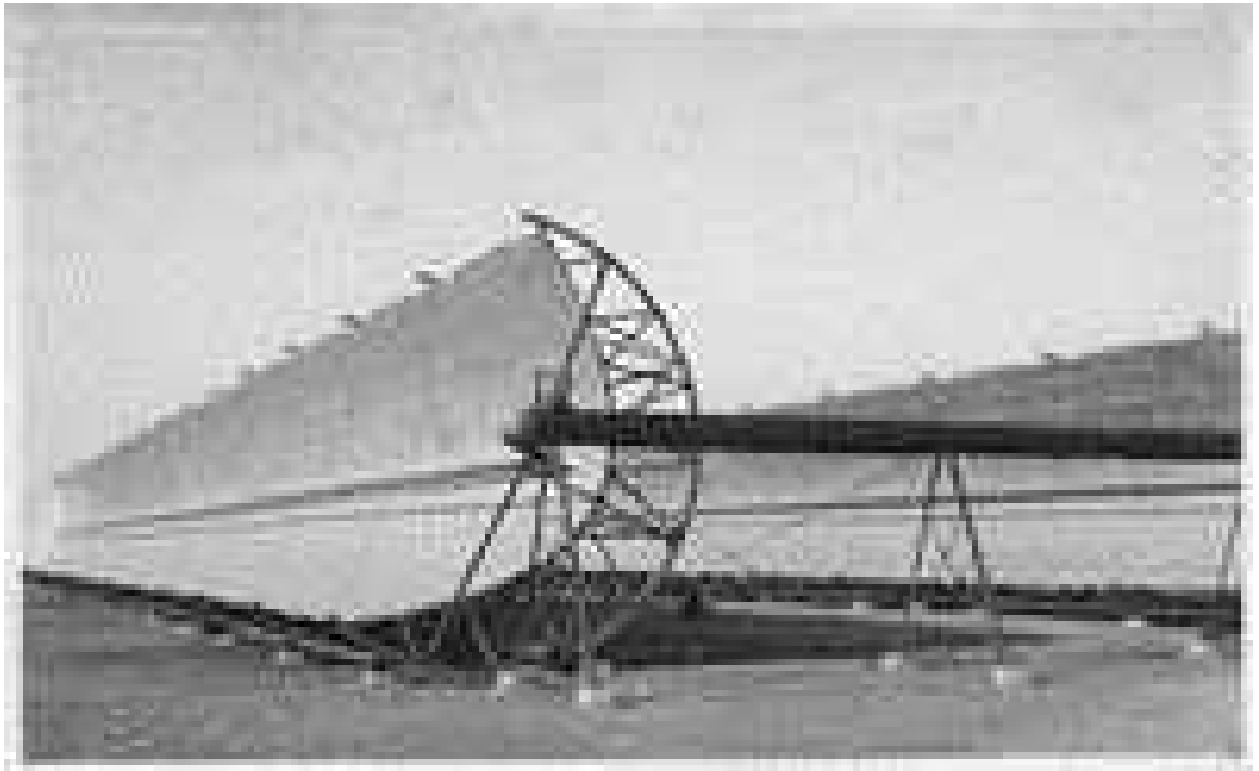
Della Bossa: un forno nel cimitero di Paderno

Messaggeroveneto

DD srl
a Mereto di Tomba (UD)

In the context of a Porto Vecchio Culture these disasters never would have happened,
because it would have been known,
that the parabolic mirror technology had failed already 110 years ago:

1913, Maadi Egypt



Tried next : Heliostat fields

for instance at Ivanpah (USA),
2010, 2.8 billion $
To be closed in 2026.

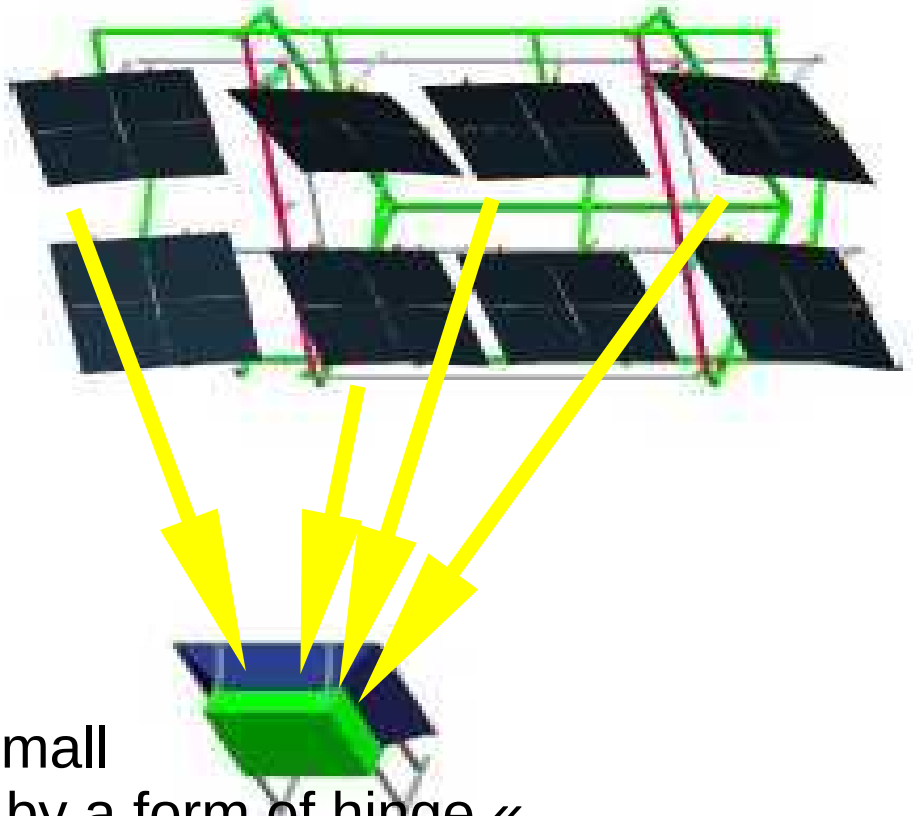
Problem:
each mirror needs 2 high precision gear motors = expensive.

modern technology cannot solve this problem

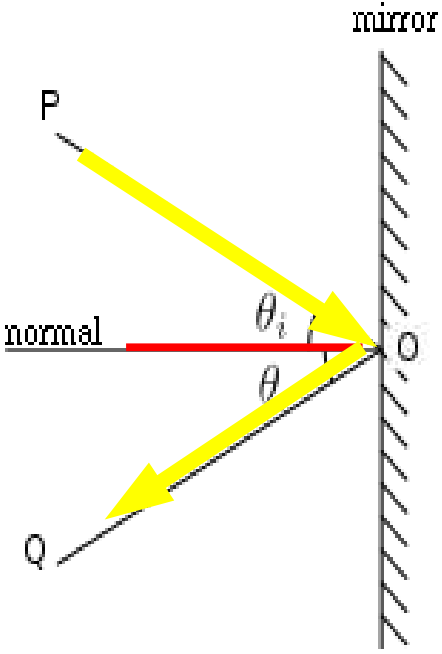
Porto Vecchio culture instead would have solved this problem already 2.300 years ago:

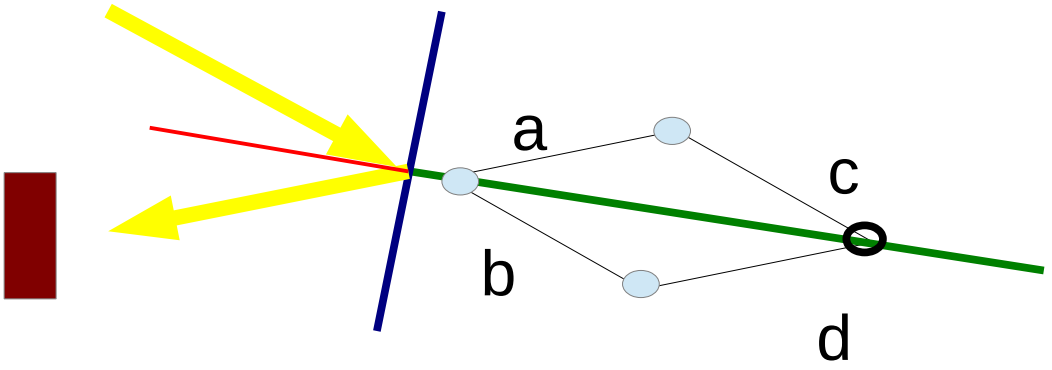
One can connect any number of mirrors in such a way, so that they move together as a system.
and reflect the sun light to a common absorber for any position of the sun.

Heat exchanger remains in a fixed position.



John Tzteztes: « Archimedes ... set similar small mirrors with four edges, moved by links and by a form of hinge «
GREEK MATHEMATICAL WORKS, Tranlated by Ivor Thomas, Loeb Classical Library, Harvard Universiyt Press, Cambridge, 1941, Vol 2, page

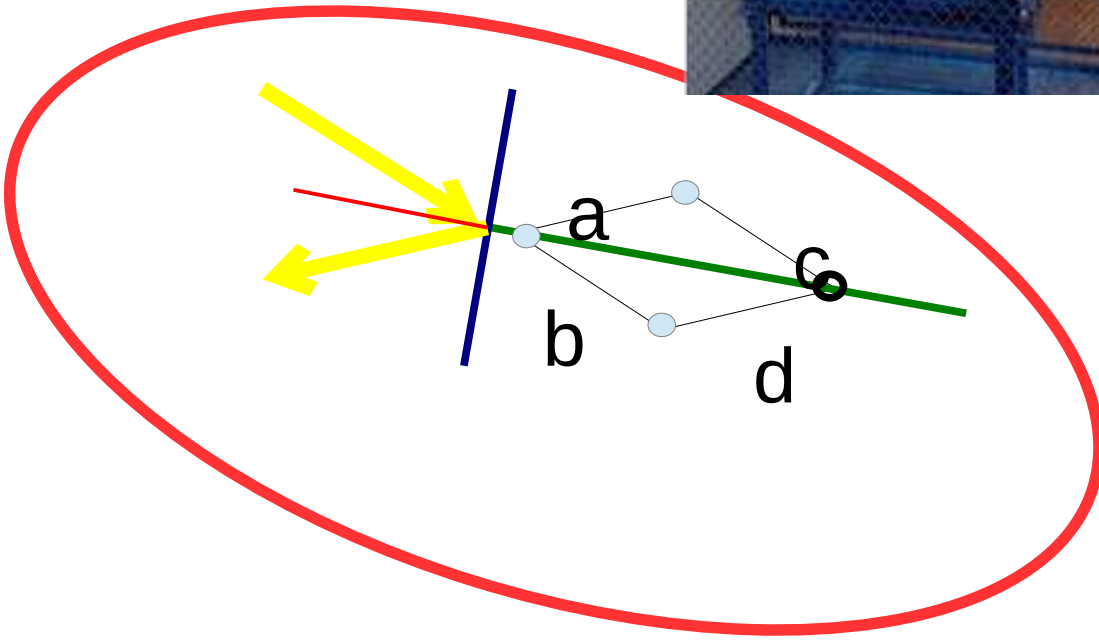




mathematics:
deltoid

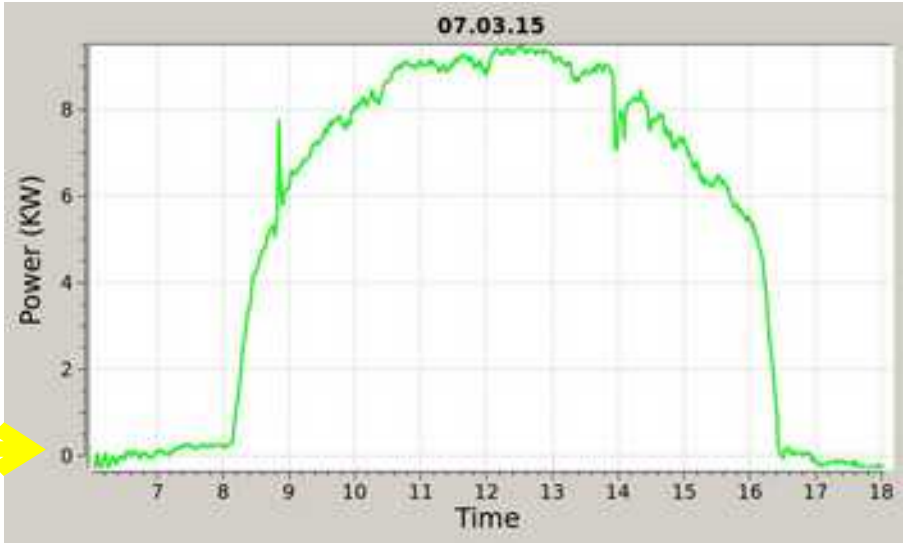
set the mirror onto a steel structure (deltoid) behind the mirror, which has the same structure as the law of reflection before the mirror

Porto Vecchio point of view:
Linear Mirror = first level UA1 muon trigger:
the information processing system is isomorph to the message set

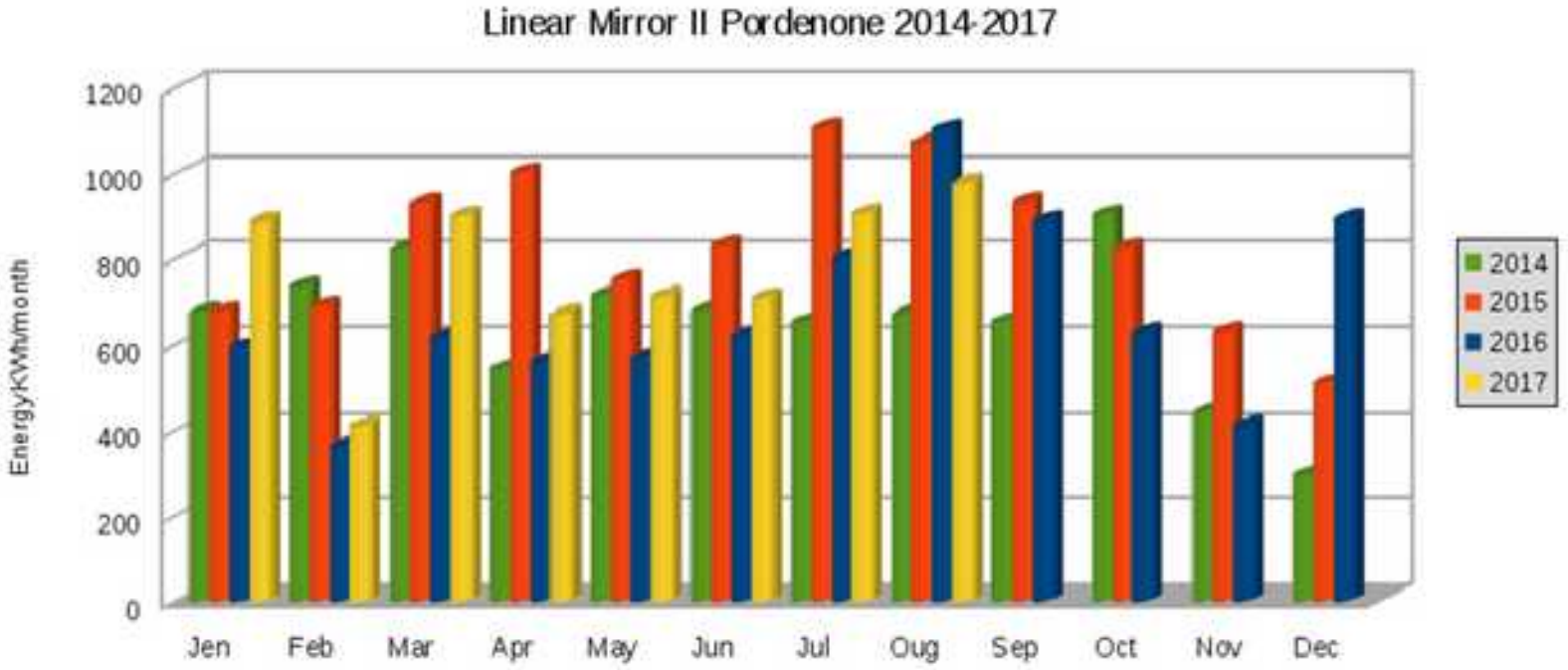


Grassmann, H., et al. (2013) First Measurements with a Linear Mirror Device of Second Generation. Smart Grid and Renewable Energy, 4, 253-258

Hotel “Il Cavaliere”, Pordenone, 2014



SPECCHI LINEARI : LE PRESTAZIONI



Diversi anni di raccolta dati: efficiente anche in inverno, sostituisce circa 1000 litri di gasolio da riscaldamento all'anno (sito Pordenone, Italia)

The Linear Mirror works well also in winter

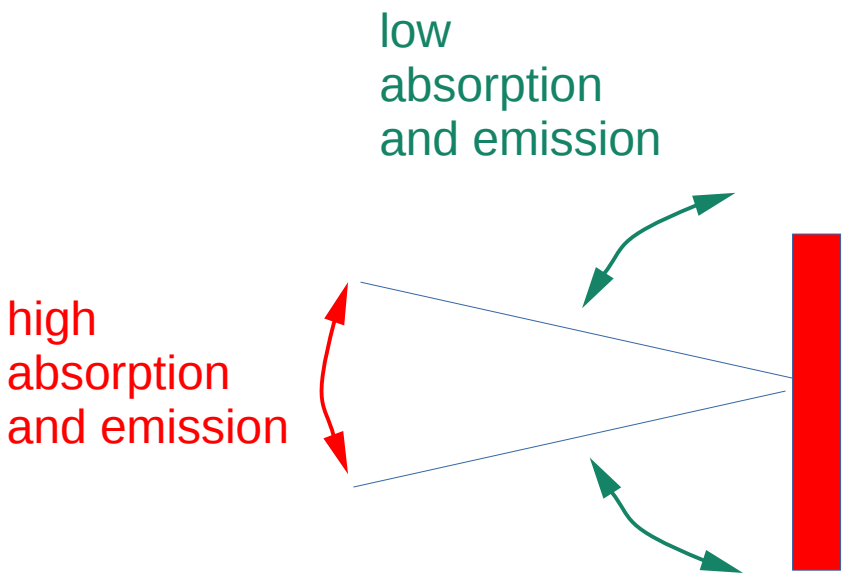
Germany (Puettlach)

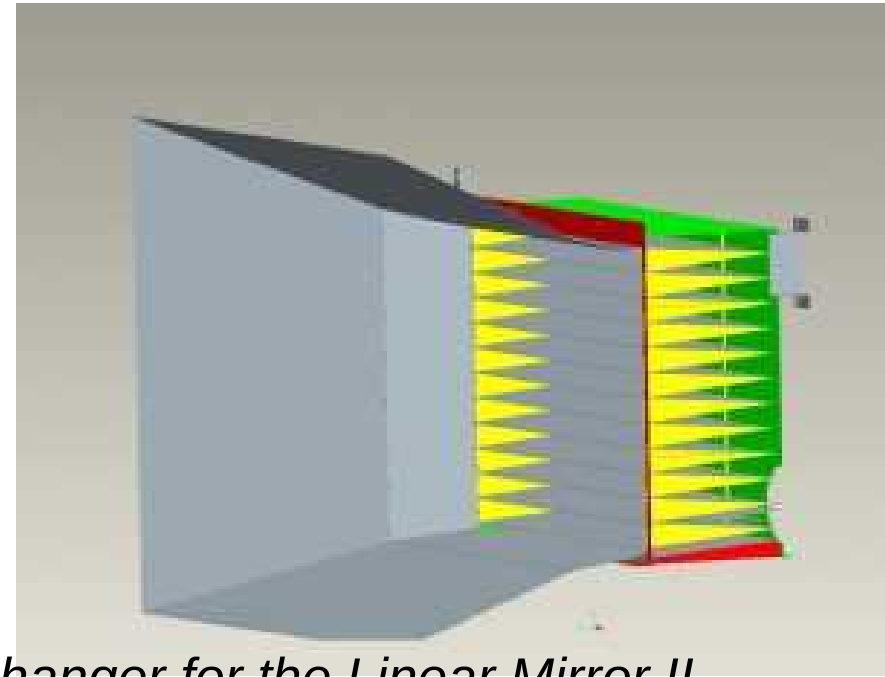
Certified industrial product: Solar Keymark

A field of new secondary technologies and applications opens, example:

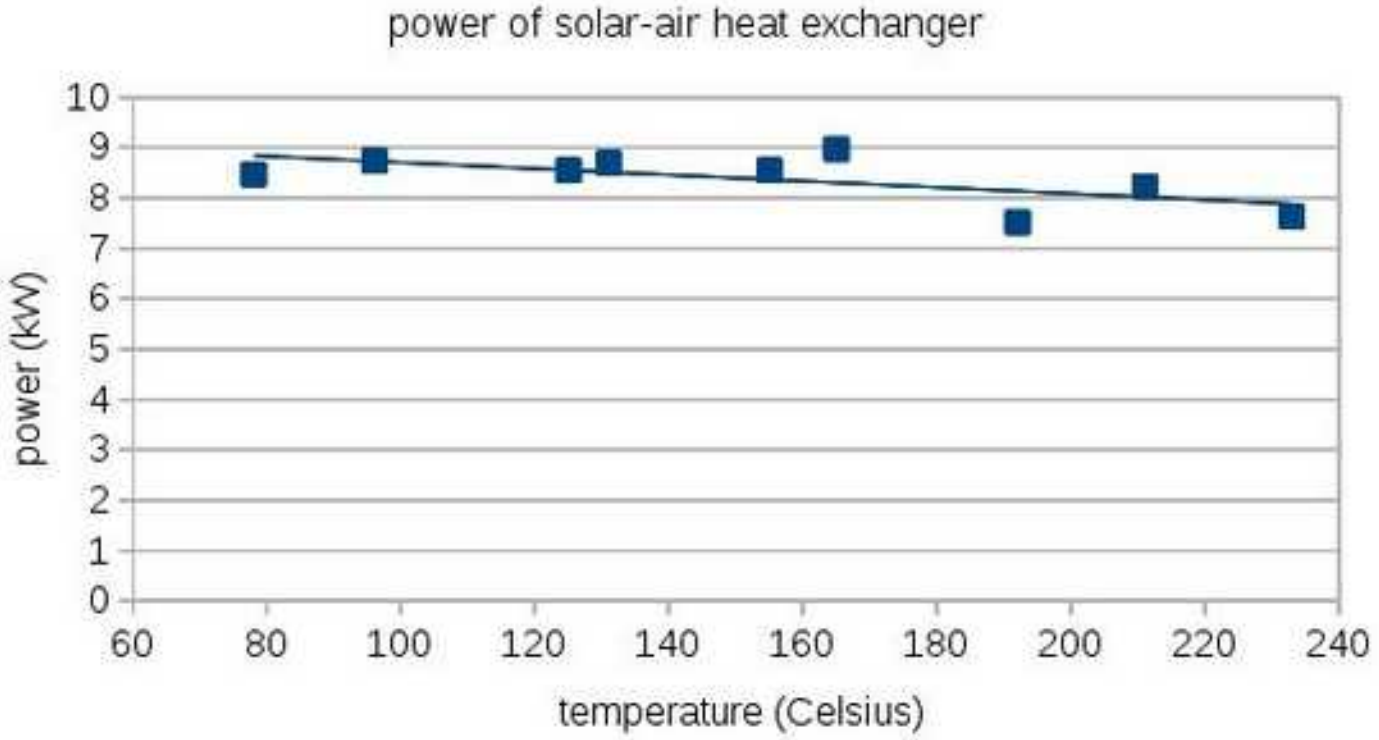
Heat exchanger sun-air

Fundamentally new kind of spatially selective surface, hot air up to 200°C





Development and Test of a New Solar-Air Heat Exchanger for the Linear Mirror II System, Hans Grassmann, Marco Citossi, Smart Grid and Renewable Energy, 2019, 10, 155-164



Suited for industrial use and new applications, for instance roasting “waste” biomass → cheap and simple carbon sequestration

The year has 8.760 hours

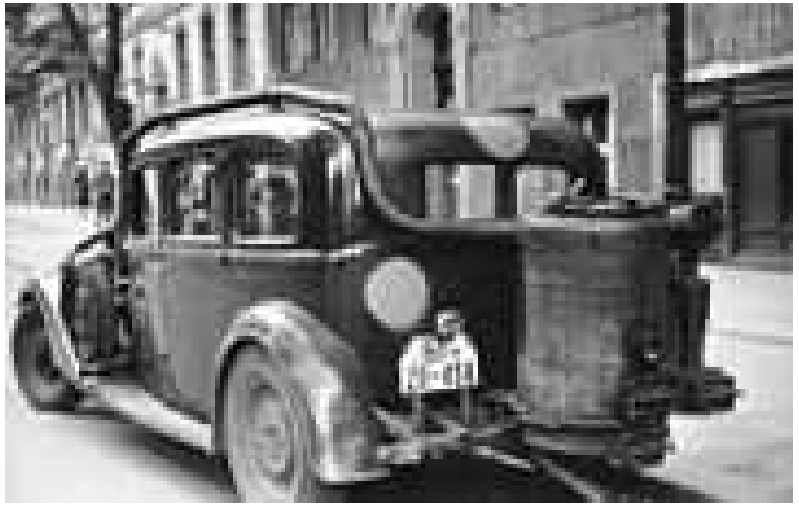
but only 1.500 hours have sun shine

and:
cars and ships need CO_2 neutral gas,
they cannot run on sun shine

4) “Waste” Biomass gasifier

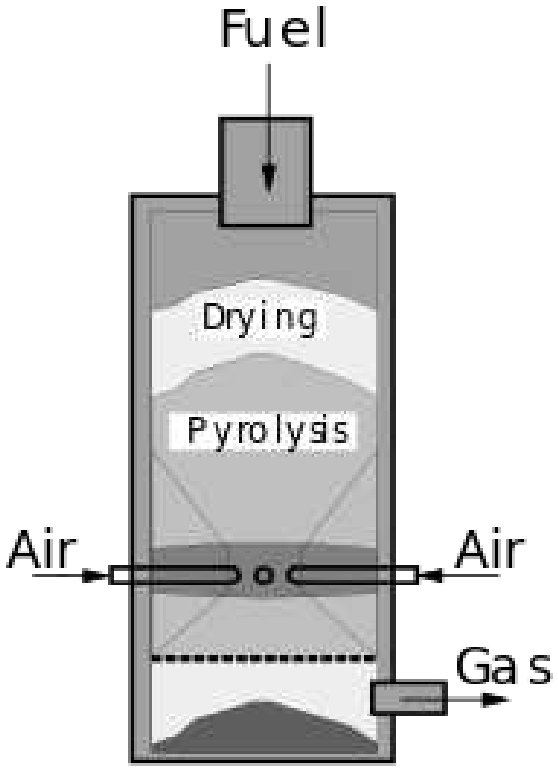
In a Porto Vecchio culture one would remember that at the times of Einstein, Planck, Rutherford, Fermi, Marconi, Siemens, Malignani … gas was provided from the gasification of coal : “town gas”

Gas can be made also from wood, however, traditional wood gasifiers are very dirty and cumbersome
and need high quality wood – deforestation problem.



Engineers have tried to overcome the limitation of wood gasifiers by adding components, making them more and more complex, large and expensive

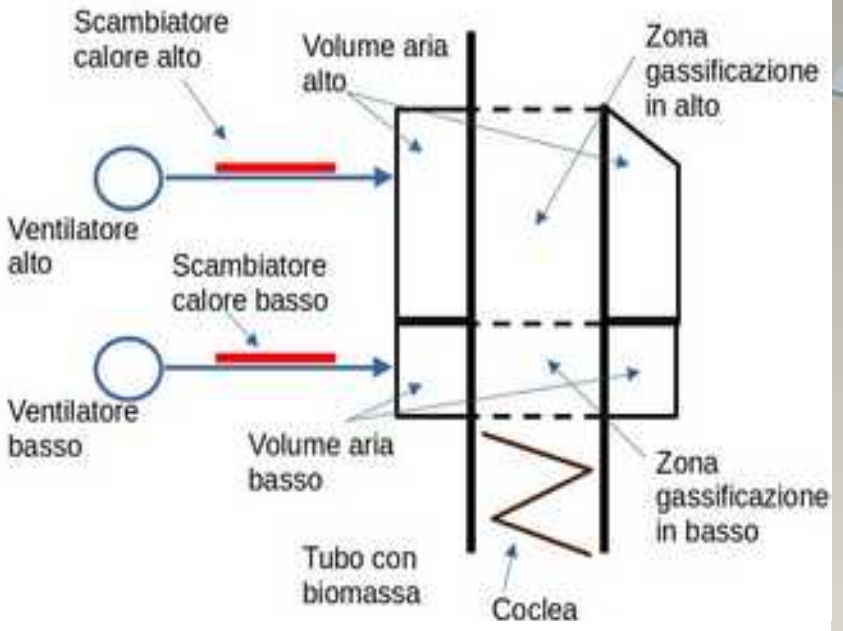
Maybe physics could give a helpful contribution to the solution of this problem ?

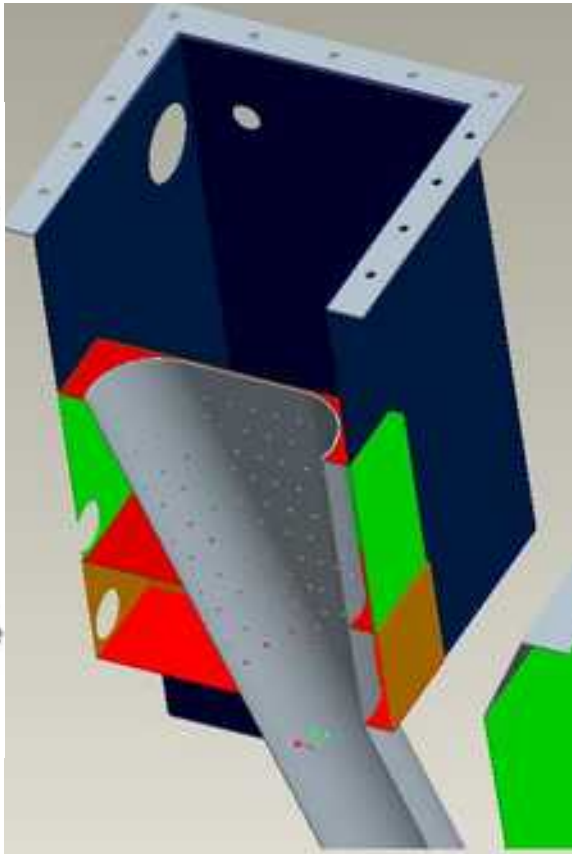


Nowadays,
gasifiers are constructed based on the paradigm, according to which gasification (in difference to combustion) occurs because of a lack of oxygen.

From a physics point of view, this paradigm is not comprehensible, the oxygen atoms cannot possibly know whether they are part of a lack of oxygen.

=> gasifier with high primary air flow
very powerful = small,
very simple,
very clean





Ca 10 kg biomass/hour, 50 kW, reactor volume 5 liters

=> power density 10kW/l = comparable to nuclear reactor

wood

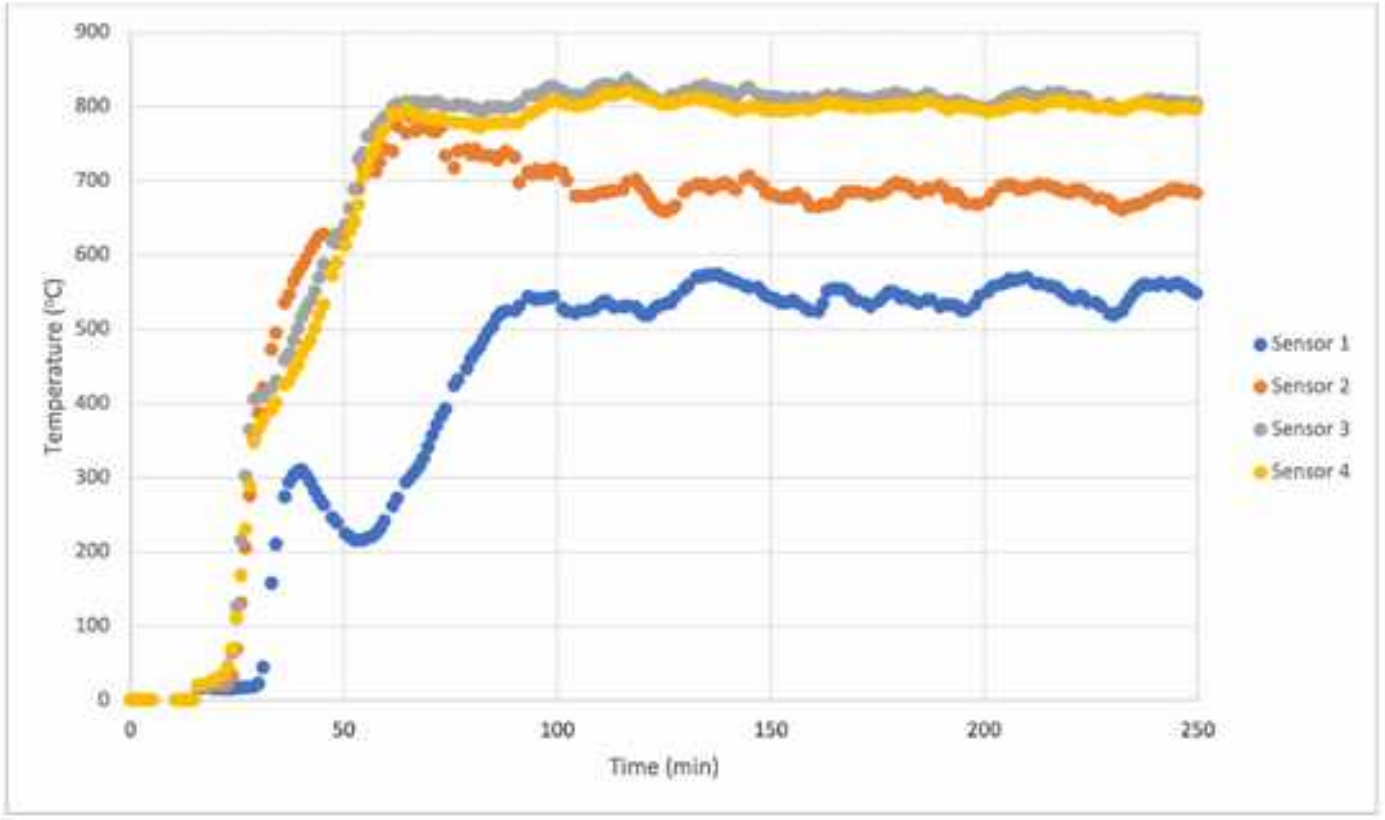


Figure 3. Results from the commissioning test of the gasifier working with wood pellets. The temperatures reported by the four sensors in ^{o}C, are shown as a function of time.

Design and Implementation of a High-Flow Biomass Gasifier Based on a Physics Driven Model, Hans Grassmann, Marina Cobal, Ram Sharma Parsu, Smart Grid and Renewable Energy, 2024, 15,276-287

Straw:

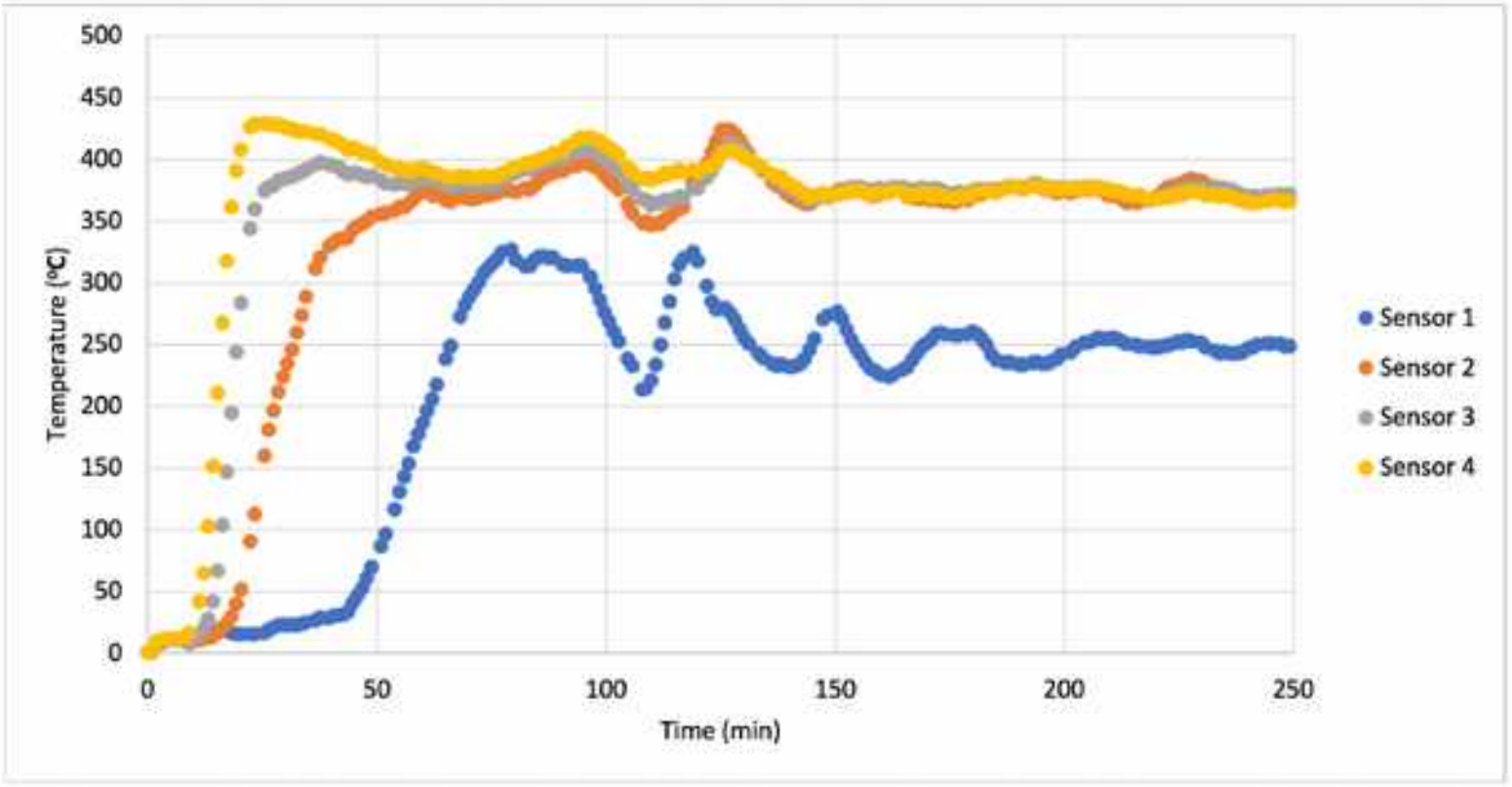


Figure 5. Results from a test of the gasifier working with straw pellets and with the temperatures controlled via the primary air flow. The temperatures in ^{o}C reported by the four sensors are shown as a function of time.

The gasifier works also at a low temperature of 400°C, therefore it can gasify even straw

It can also gasify yoghurt, potatoes, green cut, alghe, used coffee powder ….

In Italy alone, there are about 10 Million tons of straw each year, which could substitute 5 Million Tons of Diesel (= 5 billion Euro).

TABLE I. Syngas composition for two different temperatures as measured by the gas analyzer.

	Percentage (%)	
Gas	400°C	700°C
CO	14	19
H_2	14	10
CO_2	14	14
CH_4	3	14

Adding water vapor one can increase the H_2 content of the gas to >50%

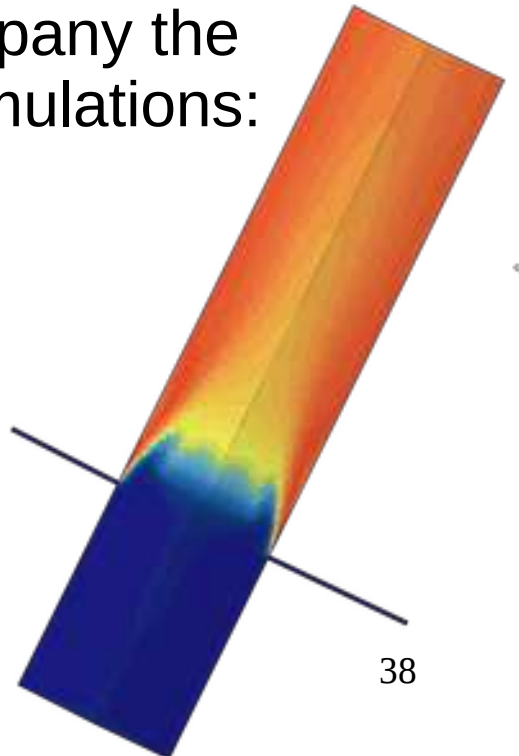
Almoust half of the atoms of biomass are hydrogen atoms
Biomass is the best, cheapest and most efficient hydrogen storage.

The new physics paradigm, according to which gasification is not caused by a lack of primary oxygen,
is therefore confirmed by the successful operation of the gasifier.

A whole new field of science and technology is opening up now.

A small international working group is forming to accompany the development of this new field by means of computer simulations:

Fabiano Bet
Daria Bostula
Parsu Ram Sharma
Hans Grassmann
Marina Cobal



There are many problems, but they are not scientific ones:
for instance, in modern society, it is not allowed to gasify greencut

Example Udine:
17.000 tons of green cut per year.
brought to San Giorgio di Nogaro for a cost of more than 100 Euro/ton and given to farmers, who **get paid** for distributing the rotten material on their fields.

With state of the art gasifier technology, it is not possible to gasify waste material like straw,
and therefore only particular “energy-plants” can be considered,
which would however be in competition to food plants (*)

(*) Integrated assessment of carbon dioxide removal portfolios: land, energy, and economic trade-ff for climate policy, Solene Chiquier et al 2025 Enviro. Res. Lett. 20 024002

If instead we use existing biomass,
which otherwise is left to decomposition
– something which would become possible in the context of a Porto Vecchio culture -
the situation changes drastically:

“global production of primary crops reached 9.9 billion tonnes in 2023” (*)

assuming that half of produced biomass is food and half is “waste”
this corresponds to about 30.000 TWh

In comparison global primary energy consumption of

traditional biomass (wood)	10.000 TWh
Gas	40.000 TWh
Coal	45.000 TWh
Oil	50.000 TWh

Future:
- biomass production per area can be increased by factor 10 with green houses
- also algae can be gasified

(*) https://www.fao.org/statistics/highlights-archive/highlights-detail/agricultural-production-statistics-2010-2023/en

Porto Vecchio is not the only time portal at this part of the world !
also at Udine there is one:

in the vicinity of a prehistoric pyramid a **laboratory for new energies** was founded at the Azienda Agraria of the University

Thanks to the General Director of the University of Udine,
Ing.Massimo Di Silverio,
Fondazione Friuli,
Fondazione Internazionale Trieste.

The need for alternative, diverse and inclusive research structures
- a Porto Vecchio culture -
is also illustrated by the history of the Linear Mirror and the Isomorph Gasifier:

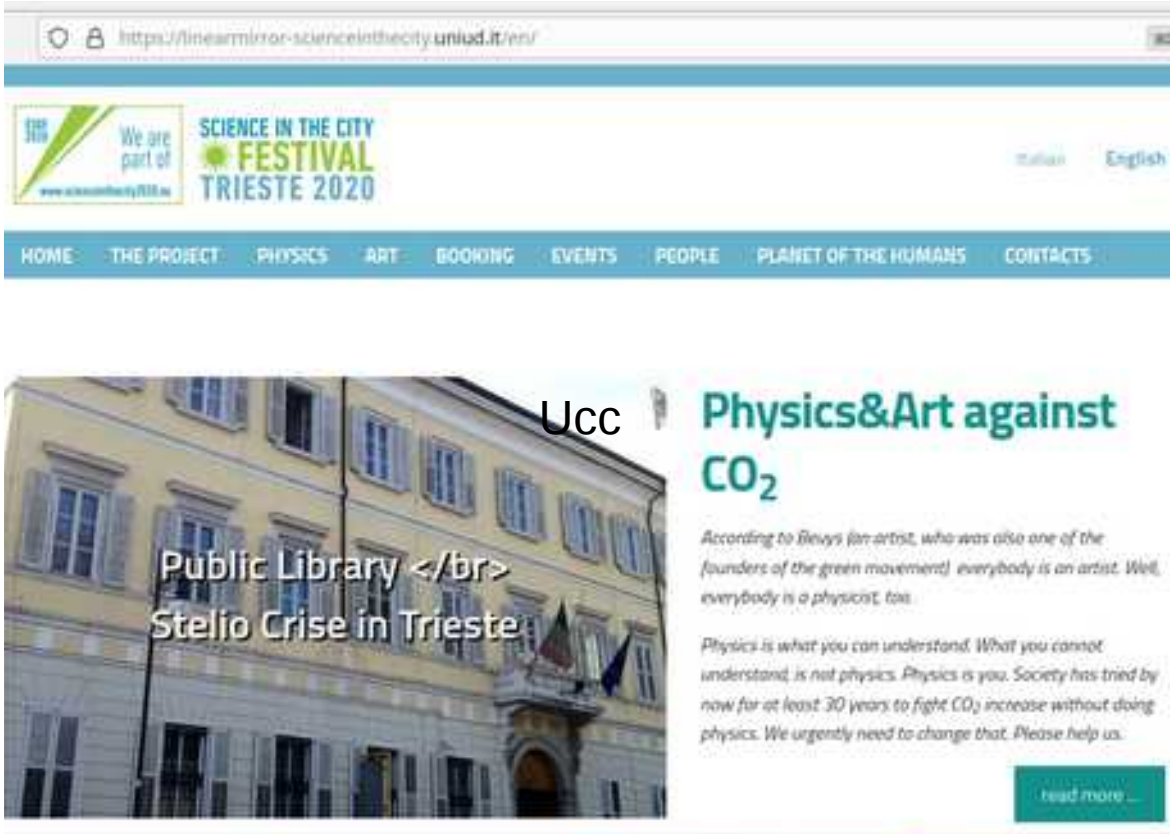
They were developed by the physics company Isomorph srl, which provided the space for doing free (= alternative, diverse, inclusive) science.

isomorph

In our project “Physics & Art against CO_2”, ESOF 2020, we connected physics to the past, transforming the state library of Trieste into an image of the old library of Alexandria.

Again, the success of that project confirms the importance and feasability of a Porto Vecchio concept:

we were the only Europeans who presented new ideas about fighting CO_2 increase at ESOF



Outlook

The Linear Mirror and the UA1 trigger are only examples:
it is true in general, that information processing systems should always have the same mathematical structure as their messages.

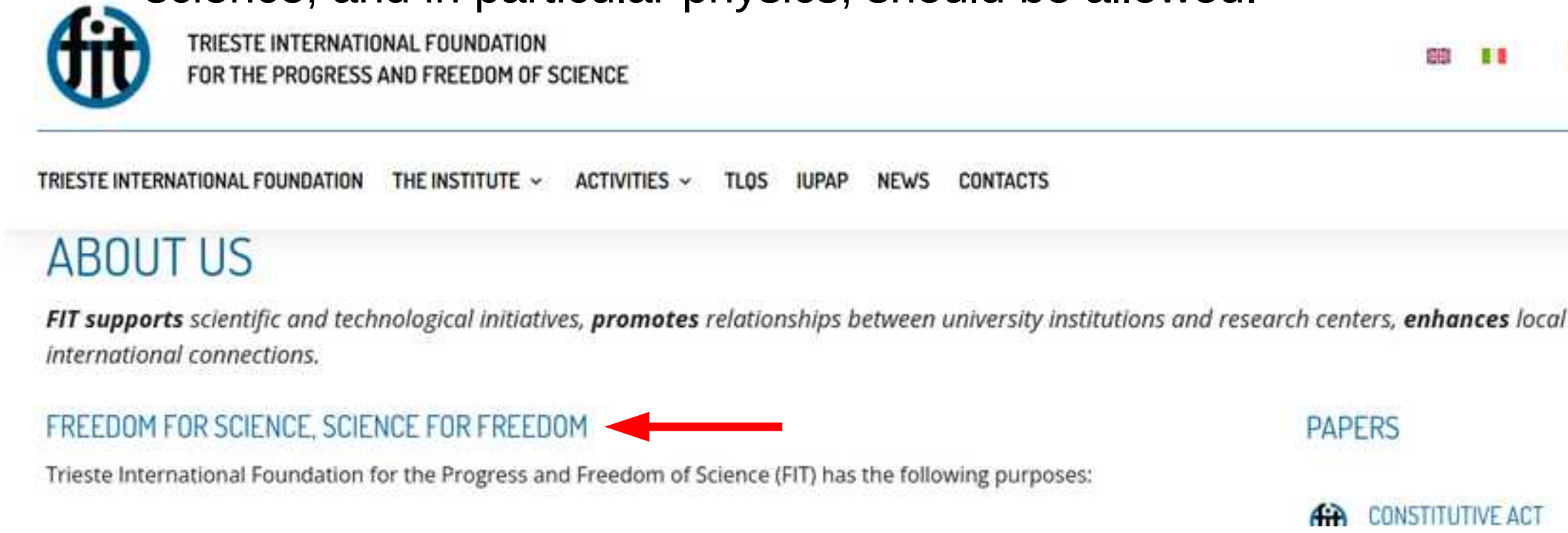
Such systems are by far superior to state of the art computing.

=> In a few years from now, will AI and quantum computing be as obsolete as Kramer Junction and Ivanpah?

Again, questions like these could be seriously discussed only in the context of a Porto Vecchio culture.

5) Conclusion

If we do not want to destroy the planet, new approaches to do science, and in particular physics, should be allowed.



Surely a good candidate for such an innovative approach would be the creation of a Porto Vecchio culture by FIT.