



Arkitektur- og designhøgskolen i Oslo
The Oslo School of Architecture and Design

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Company cooperation:

Title of project:

Prtoton Theraphy centre in Oslo

The miracles of science
Proton therapy centre in Oslo



Diploma 2017
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Institute:Fth

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01 Introduction

Proton therapy is a form of radiation therapy used to treat cancer.

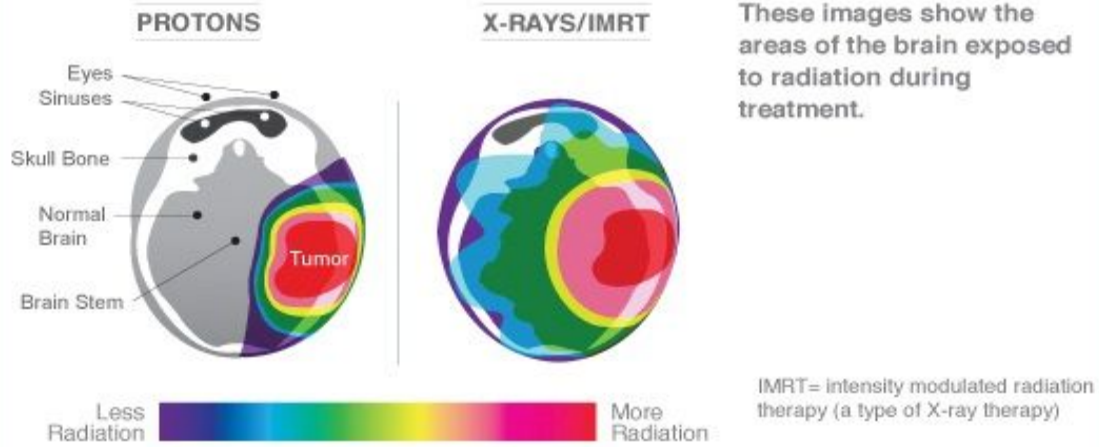
Radiation therapy treats cancer by irradiating cancer cells, and thereby destroying their DNA and disabling them from reproducing. Cancerous cells are particularly vulnerable to attacks on DNA because of their high rate of division and their reduced abilities to repair DNA damage.

Conventional radiation therapy utilizes photons or x-rays which gives the highest dose of energy at the skin and then falls slowly irradiating both the tumor and the healthy tissue before and after. The irradiation of healthy tissue causes both short-term problems, and can lead to cancer in the healthy irradiated tissue.

Proton therapy utilizes an effect called the Bragg peak. The energy delivered to the tissue in front of the tumour is relatively low, peaks in the area of the tumor, and drops to near zero after—thereby minimizing the irradiation delivered to healthy tissue, giving less side effects, and lessens the risk of cancer in irradiated tissue.

Because of the minimized side effects the treatment is especially suited for children expected to live for a long time after the treatment, and adults with certain brain tumors with critical organs nearby.

Brain Tumor: Proton therapy delivers less radiation to the brain stem, eyes, and healthy tissue than X-rays, reducing the likelihood of side effects^{3,4}



Source: ProCure Training and Development Center

Diagram showing the distribution of energy from proton vs conventional radiotherapy in an human brain.

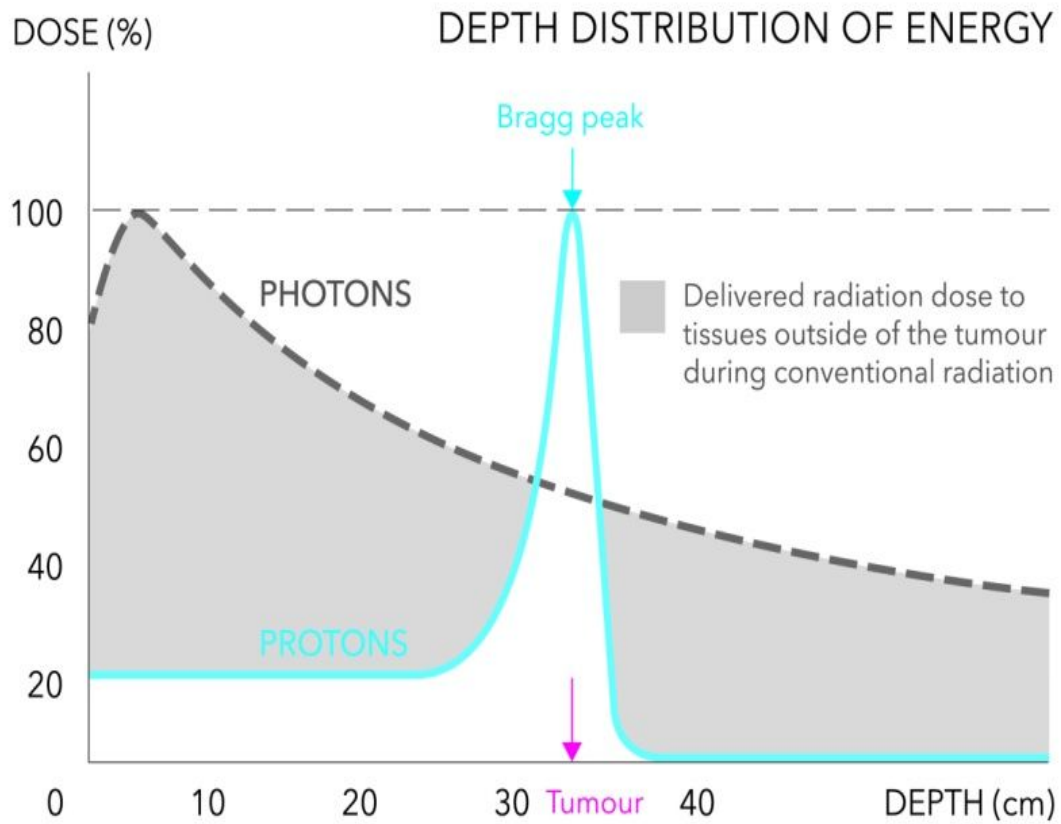


Diagram showing the bragg peak making it possible to control the distribution of energy with protons.

Stortinget has decided to build two proton centres in Norway by 2022, one in Oslo and one in Bergen. Several reports have been made concerning the development of proton centers in Norway.

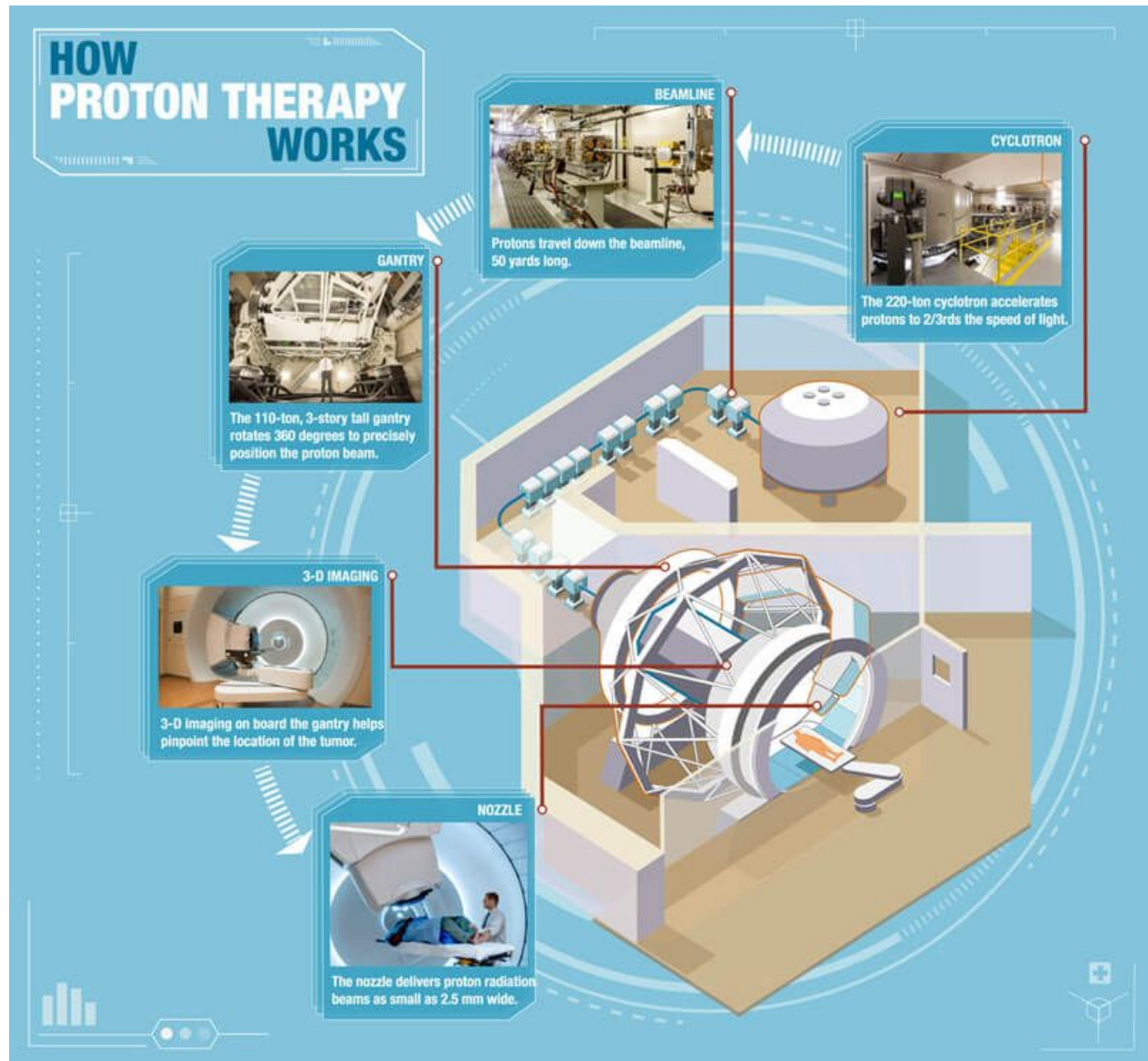
My work will relate to two reports from Helse Sørøst:

Idfaserapport for etablering av protonsenters i Helse Sørøst ved Oslo universitetssykehus 2014
Konseptfase, etablering av protonbehandling Helse Sørøst 2016

In 2016 there were 77 proton centers in the world. The closest to Oslo is Skandionkliniken in Uppsala Sweden. In 2015 Norway sent about 50 patients abroad. It has been estimated that about 10% of patients receiving radiation therapy in Norway can benefit from proton therapy, meaning 1500 patients a year.

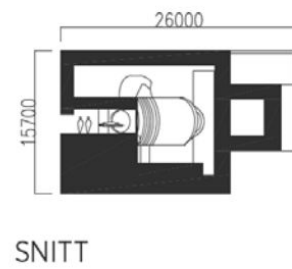
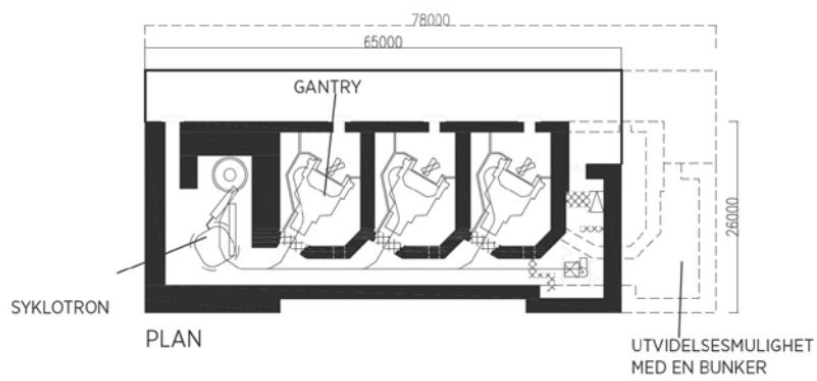
The patients undergoing therapy are in relatively good health, though the treatment can be debilitating. They spend two to three weeks in daily treatment.

Proton therapy was a direct offshoot of the Manhattan project, the first proton treatments were performed with particle accelerators built for physics research, in Berkeley California 1954 and at Uppsala in Sweden in 1957. The world's first hospital-based proton therapy center was a low energy cyclotron centre for ocular tumours at the Clatterbridge Centre for Oncology in the UK, opened in 1989.



Proton Therapy involves complex machines and cutting edge science. Because of the radiation danger, the inner workings are shielded with thick concrete walls, and are usually not expressed architecturally.

PROTOTYP PROTONBUNKERE



02 Thesis

- 1:How to express science and technique through architecture
- 2:How to express things that can not be experienced directly
- 3:How to balance the fetishication of technique with the vulnerability of the patients, between science and care

The proton centers popping up all over the world today don't technique, they look like generic hotels which is totally alienated from the purpose of the building. The heart of the building, the amazing machines, can not be experienced directly as there are big dangers of radiation.



Skandionkliniken, a proton center in Uppsala with it's generic hotel quality.

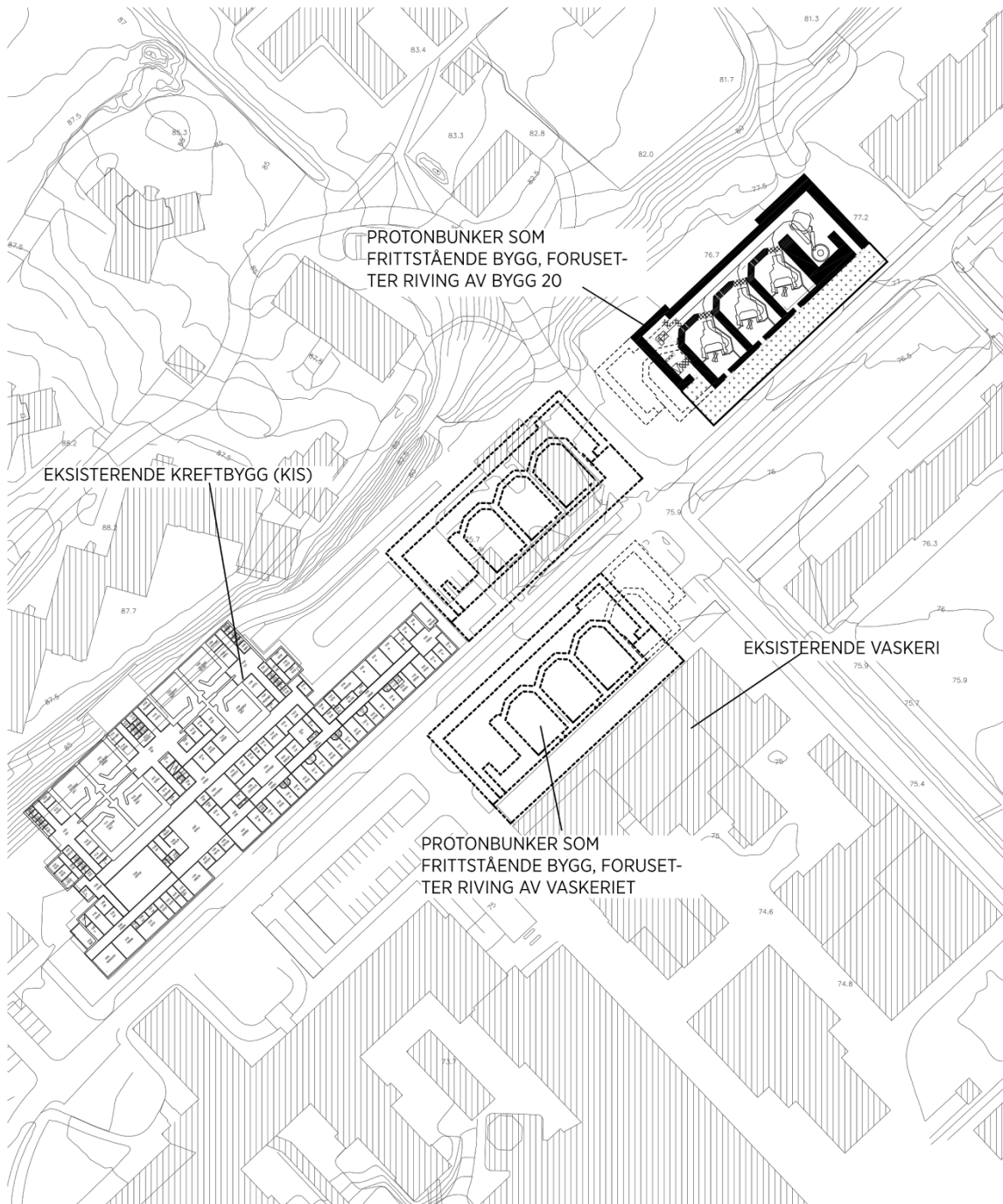
03:Site

Three sites has been proposed for the proton therapy facility in Oslo, Radiumhospitalet, Rikshospitalet and Ullevål.

I've chosen the site at Ullevål as it's a highly urban setting that allows for a freestanding building. The existing buildings range from 1917 to the Cancer centre finished in 2009 neighbouring the site . In June 2016 it was decided that Ullevål is to be closed down by 2030, I presuppose that supporting programs will continue to be taken care of externally.



The site at Ullevål in red.



Site with alternative placements in dashed, and a plan of the existing cancer facility

04 Programme

Cf Møller has made a detailed room programme for a proton centre at Ullevål which i will relate my diploma to. The programme is 4000m² in total, with 1700 m² being the equipment in itself. This programme relies on a lot support functions from the existing Ullevål sykehus. A stand alone unit not relying on the hospital would need an additional 4000m².

Romprogram for lokaliseringer ved Radiumhospitalet eller Ullevål:

Bygningsdrift				
Lagerareal teknisk utstyr	1	20	20	
Kontor	0	15	0	
Delsum				20
Drift av partikkelanlegg				
Kontorer teknisk drift anlegg	1	10	10	
Landskap samme	0	24	0	
Verksted grovt	1	50	50	
Verksted fint	0	50	0	
Lagerareal utstyr	1	100	100	
Pauserom/møterom	1	20	20	
Verksted kompensatorer	0	100	0	
Delsum				180
Behandlingsrom med kontorer				
Ct/fiksering	1	100	100	
MR	0	150	0	
Pet	0	80	0	
Anestesi	1	15	15	
Oppvåkning	1	20	20	
Møterom 1	2	15	30	
Møterom 2	0	20	0	
Undervisningsrom	0	40	0	
Auditorium	1	50	50	
Undersøkelsesrom	1	15	15	
Samtalerom	1	15	15	
Doseplan	1	20	20	
Kontrollrom	3	15	45	
Kontorer enkle	19	10	190	
Kontor landskap	0	36	0	
Lagerrom	2	12	24	
Medisinrom	1	10	10	
Forsyningsrom varer inn	1	15	15	
Renholdsrom	1	5	5	
Moppevaskeri	0	30	0	
Lager rekvisita	2	12	24	
Kontor service	0	10	0	
Søppelrom	1	15	15 ?	
Spiserom	1	20	20	
Garderobe	2	15	30	
Delsum				643
Pasientrelatert				
Resepsjon	1	15	15	
Omkleddningsrom/fikseringsrom	6	10	60	
Venteareal	1	30	30	
Lekerom	1	25	25	
Stillerom	1	15	15	
Delsum			0	145
Forskningsareal/laboratorium	1	100	100	
				100
Netto				1088
Brutto netto faktor		2,2		
Brutto				2394
Stråleavsnitt	1	26	65	1690

5 Submitted material

Drawings in 1/1000, 1/50, and 1/5

Situation model in 1/500

Presentation model 1/100

6 Schedule

1:site model

2:Programme studies

3:Room studies

4:preliminary projekt

And so on

7 reference Projects



Ludwig Leo: Circulation tank 1974

The circulation tank in Berlin by Ludwig Leo makes the technique the main expression of the building



Skandionklinikken Link arkitektur 2014

Is it an apartment complex, is it an office block? no, it's a proton centre. The technique is expressed neither outside or within this building.



Lascaux Caves Visitors Centre, Snøhetta 2016

The 20000 years old Lascaux caves in France has been closed to visitors since 1963 because the wear and tear was threatening the integrity of the cave paintings. A simulation, complete with wheelchair accessibility and for some reason backlighting, opened nearby in 2016.



Wedding reception at the Parthenon, Nashville Tennessee.

A full scale replica of the Parthenon built in 1897 for the Tennessee centennial exhibition.



Iñigo Manglano-Ovalle, Phantom truck, 2008

A full scale model of the mobile chemical weapons plants shown by colin powell to the UN at the outset of the iraq war,

8 references

Idefaserapport for etablering av protonsenters i helse sørøst ved oslo universitetssykehus 2014

Konseptfase, etablering av protonbehandling helse sørøst 2016

Donogoo tonka or the miracles of science. A cinematic tale, Jules Romains 1920

Art in the age of reproduction, Walter Benjamin, 1936

Jean Baudrillard, Simulations, 1984

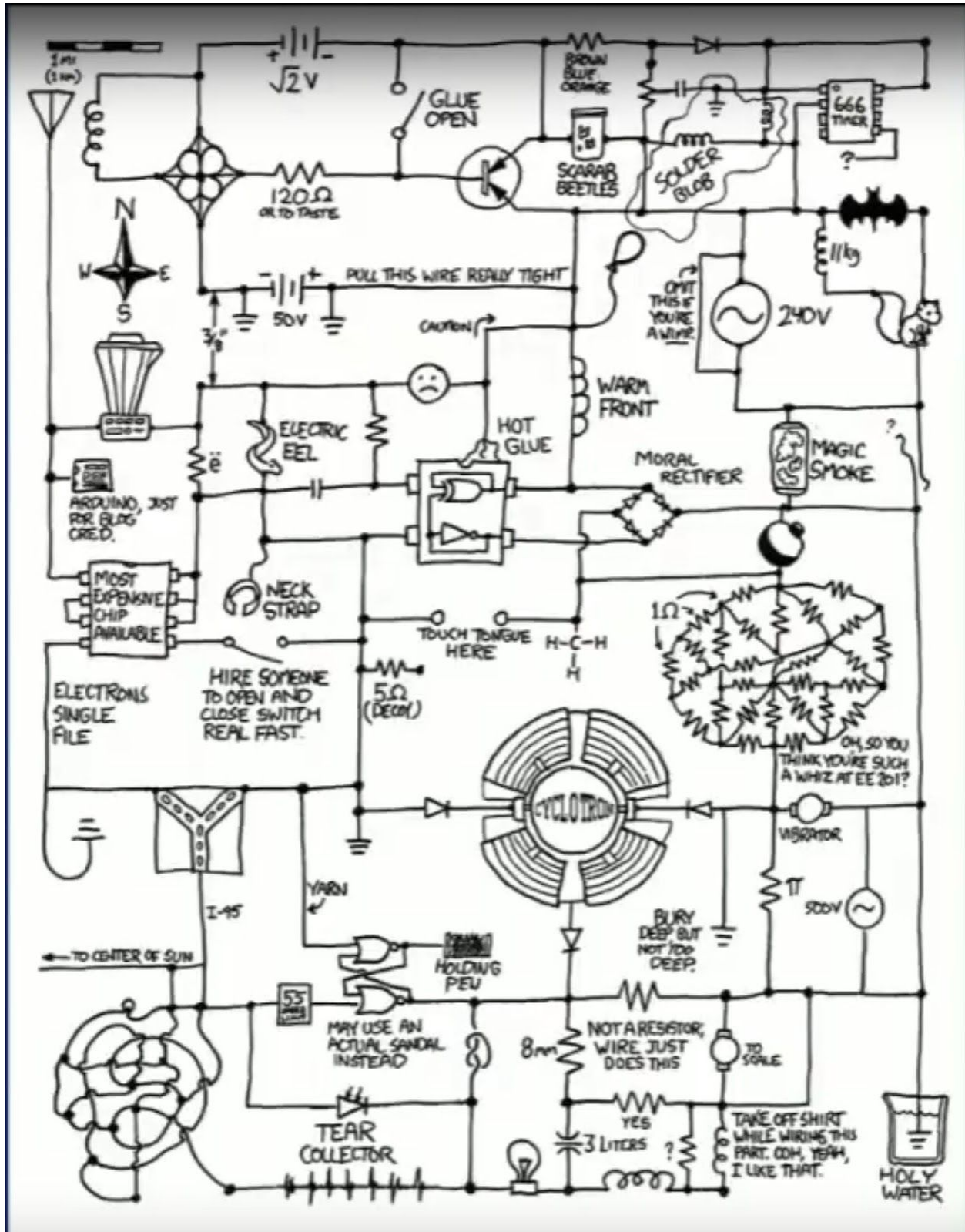
**DONOGOO
TONKA
or
THE
MIRACLES OF
SCIENCE**

A Cinematographic Tale

Jules Romain

translated by Brian Evenson
with an Afterword by Joan Ockman

The plot of *Donogoo Tonka or the miracles of science* concerns a famous geographer whose academic career is about to be derailed by the revelation that he has invented a city in South America. Through a sequence of events, a suicidal young man finds a new mission in life by undertaking to found the fictional city, thereby redeeming the error and reputation of the absentminded professor, only to find it's already been founded.



Fictional diagram of Proton therapy, author unknown