Security of Science

https://berthub.eu/vvtp - https://berthub.eu/

bert@hubertnet.nl

https://opentk.nl/

Universiteit Leiden

KIESRAAD

Toetsingscommissie Inzet Bevoegdheden

POWERDNS (advisor)

TU Delft

FOX-IT
FOR A MORE SECURE SOCIETY

POWERDNS

POWERDNS

TU Delft

scientific data

Data Descriptor | Open access | Published: 22 March 2022

SkewDB, a comprehensive database of GC and 10 other skews for over 30,000 chromosomes and plasmids

Bert Hubert

Scientific Data **9**, Article number: 92 (2022) | Cite this article

The ISME Journal
Multidisciplinary Journal of Microbial Ecology

Original Article | Published: 03 July 2015

Density-dependent adaptive resistance allows swimming bacteria to colonize an antibiotic gradient

Felix J H Hol, Bert Hubert, Cees Dekker & Juan E Keymer

The ISME Journal **10**, 30–38 (2016) | Cite this article

Toetsingscommissie Inzet Bevoegdheden

“I don’t want war, so I hope we can be scary enough no one will start one against us. And if we do have a war, I think we should win it”

Aerospace & Defence + Add to myFT

Europe’s defence start-ups in funding shortfall despite looser bank policies

HSBC and Revolut among those restricting lending to sector in a sign of hurdles to rebuilding region’s arms industry

A Ukrainian serviceman with a drone. Banks are a vital source of finance for Europe’s defence tech start-up sector
© Ed Jones/AFP via Getty Images

NATO

OTAN

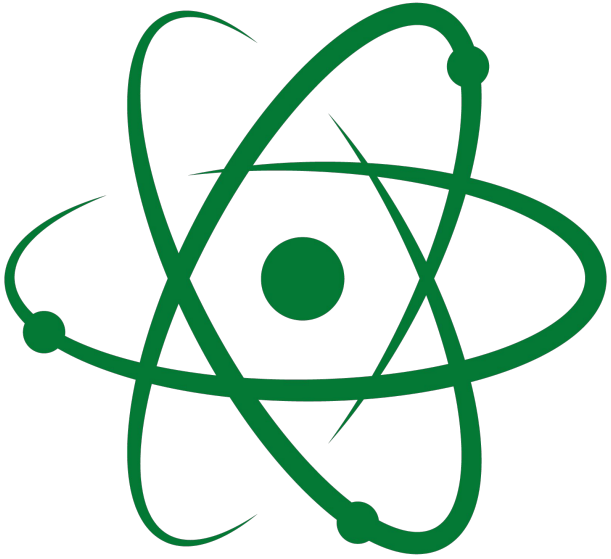
Materials **science** gets us the knowledge of lithium (cells) and lightweight fiber optics

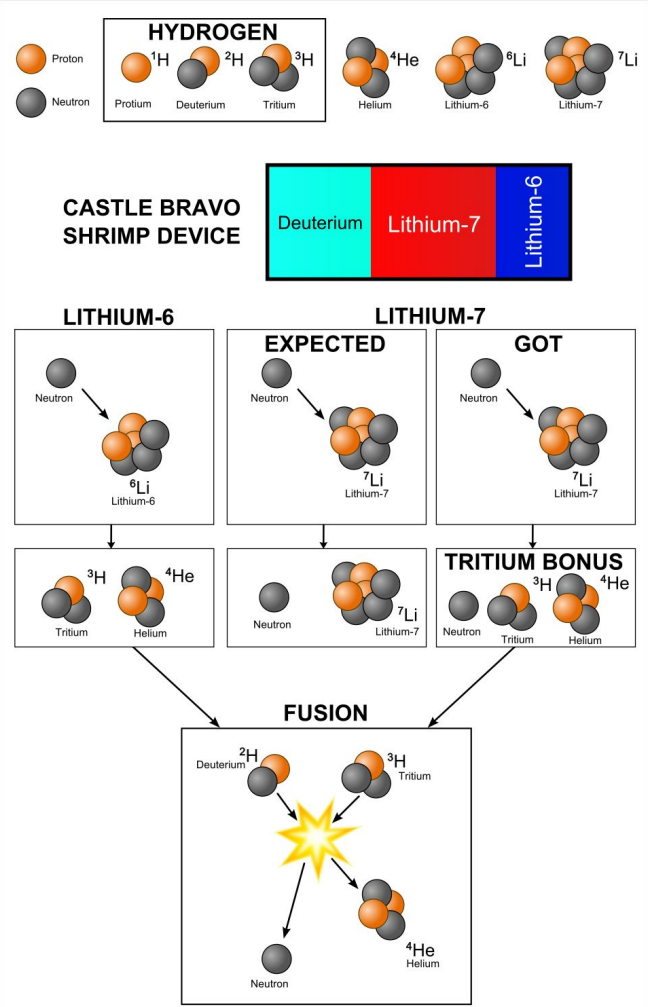
Engineering gets us batteries that can fly drones long enough and really thin fibers

The complete drone is **technology**

And **warfare** happens with technology (& will)

Castle Bravo, March 1st 1954, ~~5~~ 15 megatons



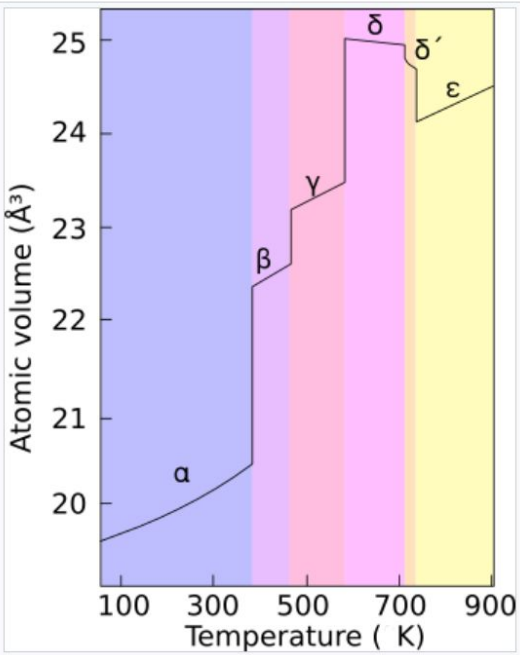


SHRIMP

The *SHRIMP* device in its shot cab

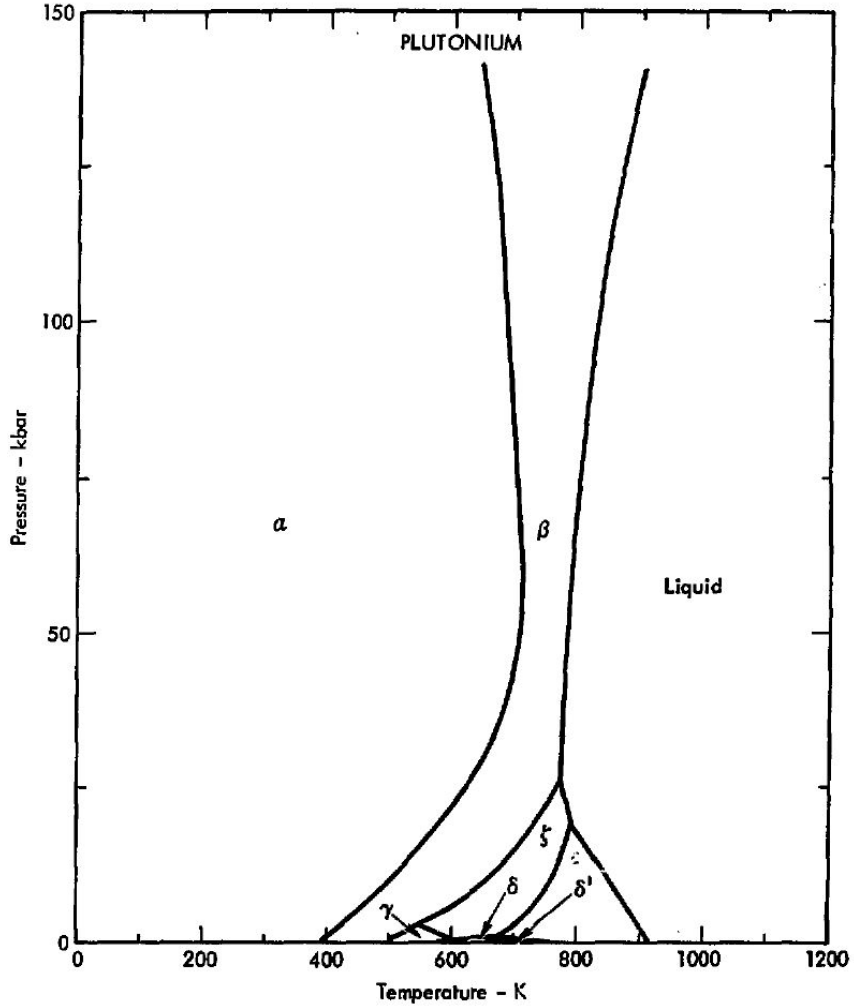
Type	Teller–Ulam design thermonuclear weapon
Production history	
Designer	Ben Diven (project engineer)[6]
Designed	24 February 1953
Manufacturer	Los Alamos National Laboratory
Unit cost	$2.7 million (1954) ($24.9 million in 2024 dollars[7])
Produced	October 1953
No. built	1
Variants	TX-21C, TX-26
Specifications	
Mass	10,659 kg (23,499 lb)
Length	455.93 cm (179.50 in)
Diameter	136.90 cm (53.90 in)
Filling	Lithium-6 deuteride
Filling weight	400 kg (880 lb)
Blast yield	Expected: 5 megatons of TNT (21 PJ) Actual: 15 megatons of TNT (63 PJ)

"The most explosive physics experiment ever"

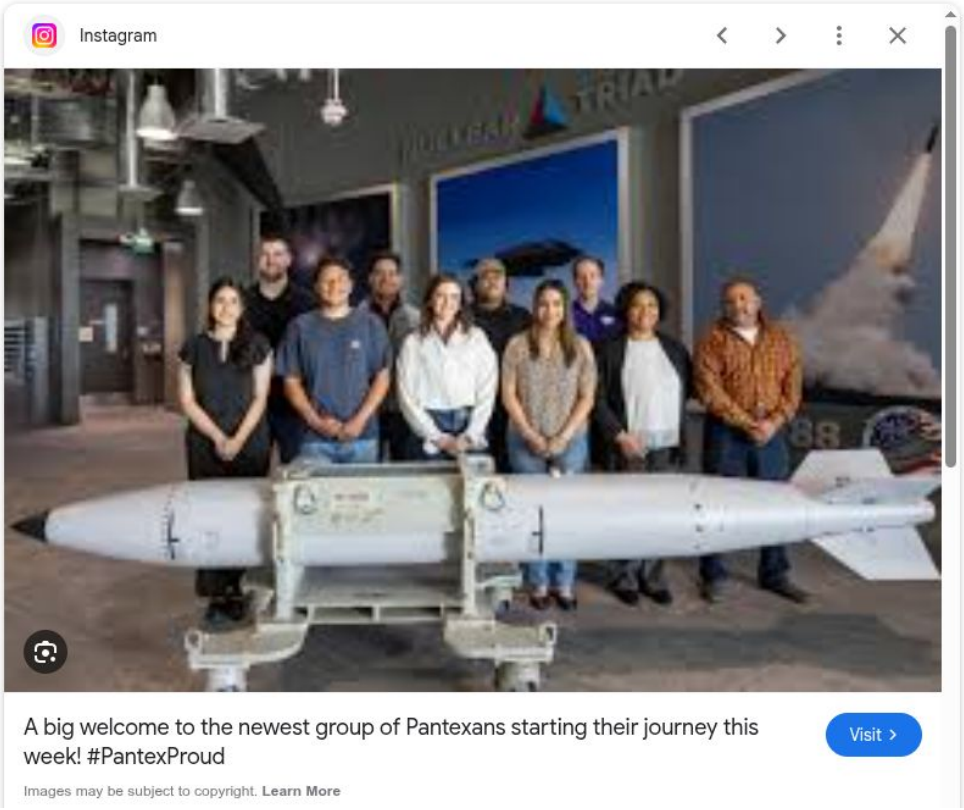


A diagram of the allotropes of plutonium at ambient pressure. Atomic volumes in cubic angstroms.

Phase	Crystal structure	Density (g/cm^3)
alpha (α)	simple monoclinic	19.86
beta (β)	body-centered monoclinic	17.70
gamma (γ)	face-centered orthorhombic	17.14
delta (δ)	face-centered cubic	15.92
delta prime (δ′)	body-centered tetragonal	16.00
epsilon (ε)	body-centered cubic	16.51



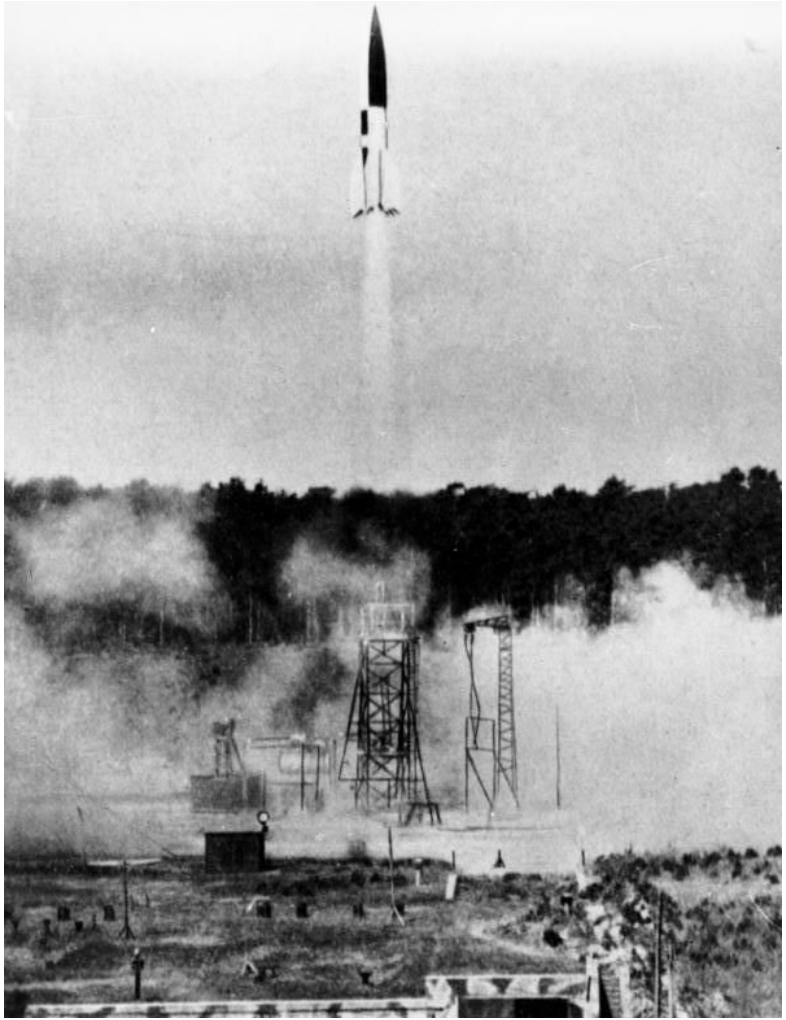
Universities -> Los Alamos National Labs -> Pantex



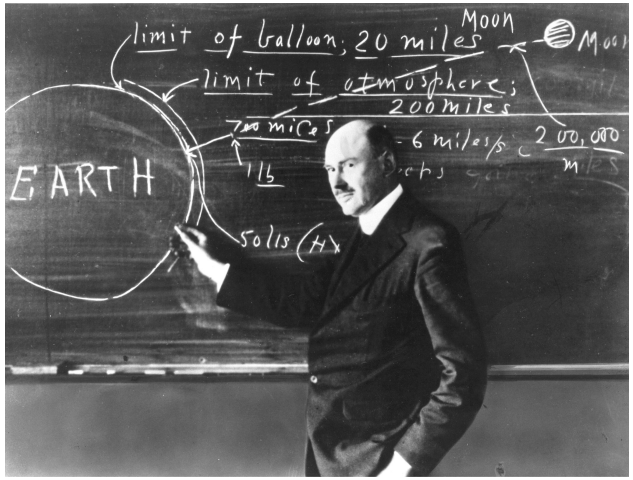
7 Ways Pantex Protects the Environment

Posted: Monday, April 18, 2022, 12:47 pm

The Pantex Wind Farm has allowed the site to consistently exceed DOE goals regarding the use of renewable energy and reduce energy-related greenhouse gas emissions.



“Kurt Debus was a member of the Schutzstaffel (SS) during World War II, where he served as a V-weapons flight test director. Following the war, he was brought to the United States via **Operation Paperclip**”



Robert Goddard,
Princeton

"Waffenamt was the German Army Weapons Agency. It was the centre for research and development of the Third Reich for weapons, ammunition and equipment"

"Operation Paperclip"

“Once the rockets are up

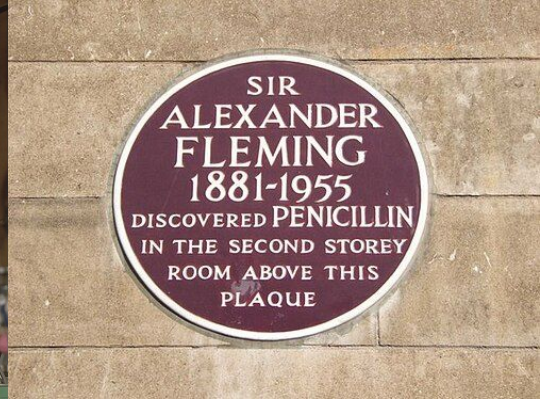
Who cares where they come down?

That’s not my department

Says Wernher von Braun”

Tom Lehrer

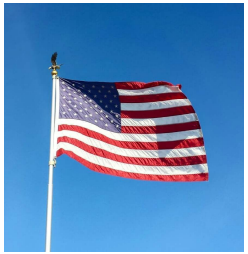

MEDICAL RESEARCH COUNCIL
British Standard Penicillin
Contents = approx. 30 mgm.
1 MGM. = 1600 INTERNATIONAL UNITS OF PENICILLIN
Supplied by The National Institute for Medical Research, N.W.3
No. 43 Issued 27.4.46
Keep Dry. Store at 0°C. or below.



London Hospital, 1928 - 1929

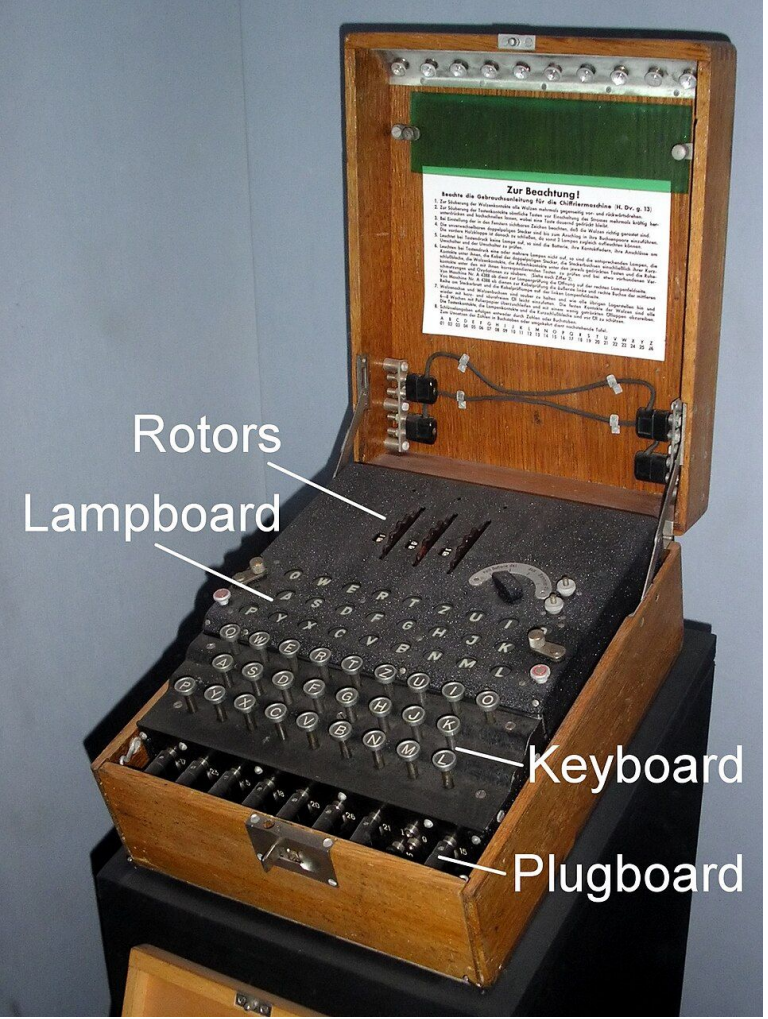
Oxford, 1939

“During the Second World War penicillin became an important part of the Allied war effort, saving thousands of lives”

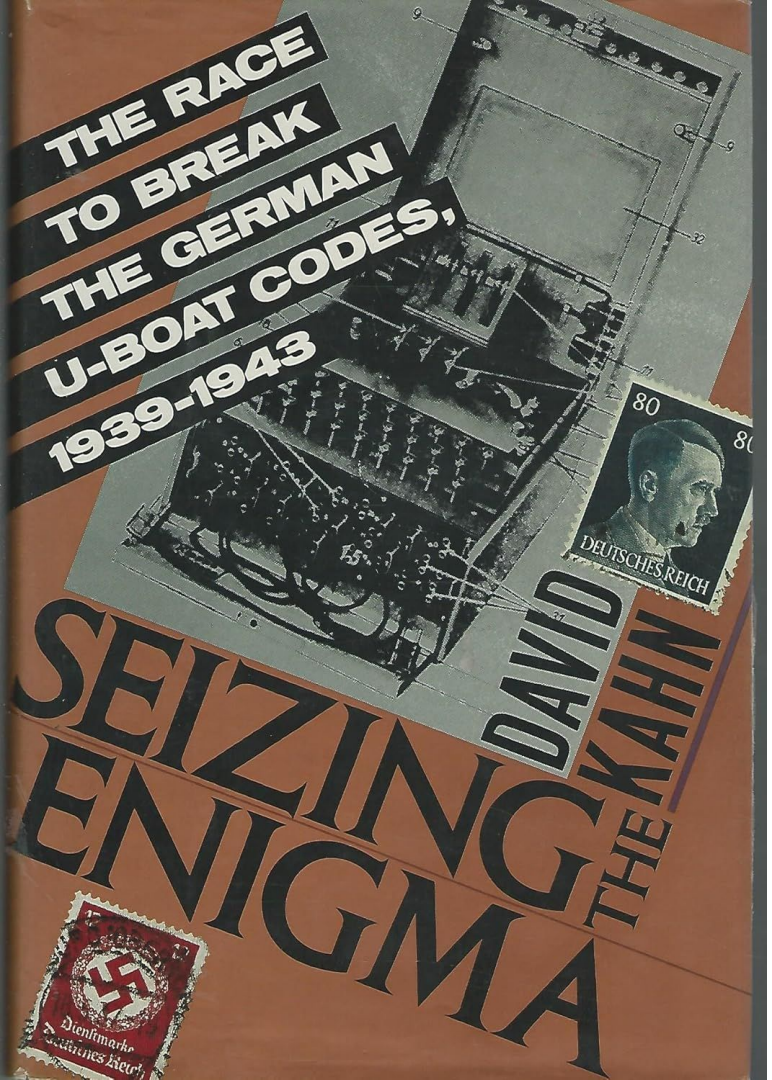


1943

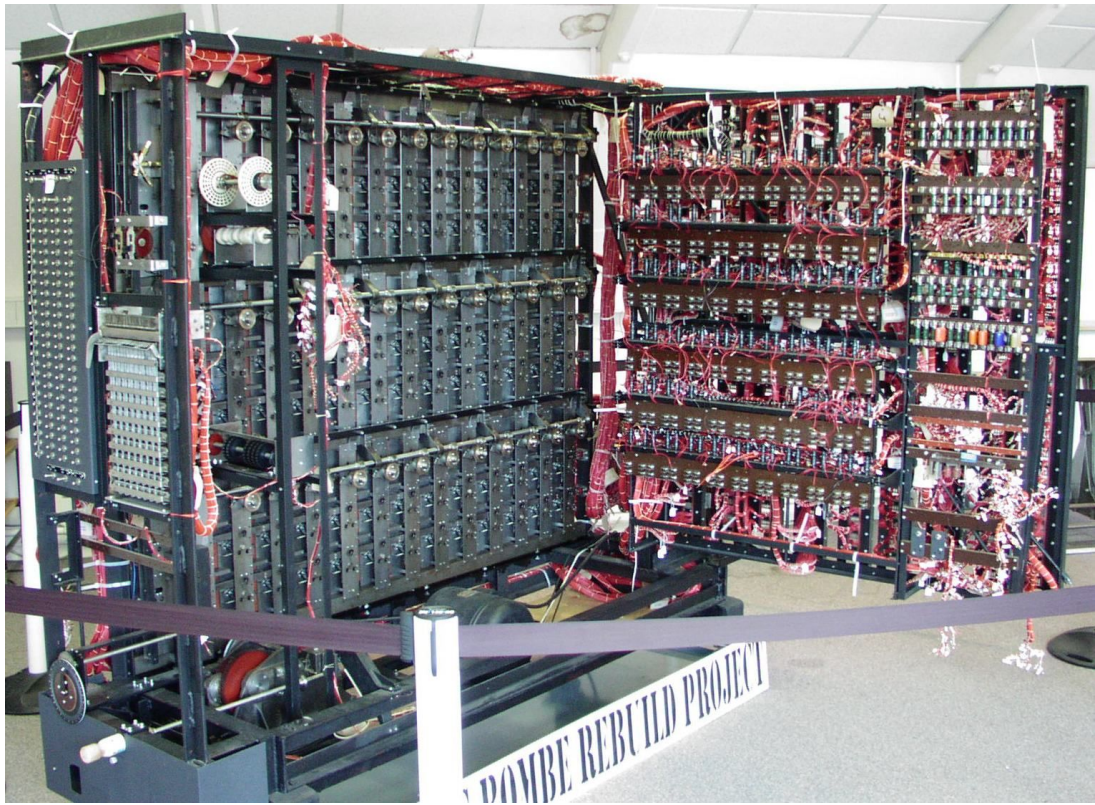
Pfizer



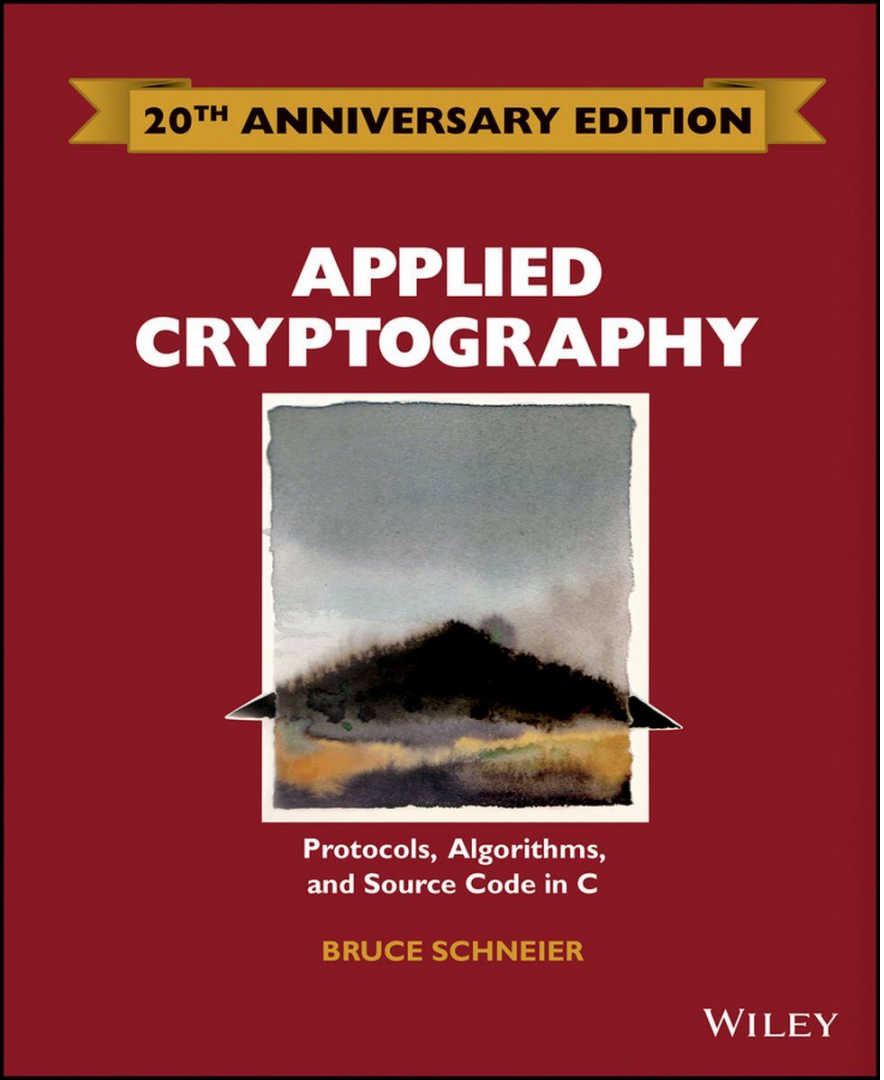
Marian Rejewski, Polish mathematician, Poznań University **and** Polish General Staff's Cipher Bureau



Alan Turing: Cambridge -> Princeton -> Cambridge
“From September 1938, Turing worked part-time with the GC & CS, the British codebreaking organisation.”



<- 1991 book, including vital “Doctrine”



1995
“The book the National Security Agency wanted never to be published”

BIRTH OF RADAR MEMORIAL

ON 26th FEBRUARY 1935, IN THE FIELD OPPOSITE

ROBERT WATSON WATT AND ARNOLD WILKINS

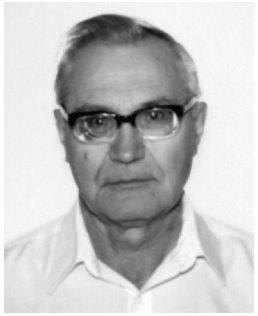
SHOWED FOR THE FIRST TIME IN BRITAIN THAT AIRCRAFT COULD BE DETECTED BY BOUNCING RADIO WAVES OFF THEM. BY 1939 THERE WERE 20 STATIONS TRACKING AIRCRAFT AT DISTANCES UP TO MORE THAN 100 MILES. LATER KNOWN AS RADAR, IT WAS THIS INVENTION, MORE THAN ANY OTHER, THAT SAVED THE RAF FROM DEFEAT IN THE 1940 BATTLE OF BRITAIN.

The experimental "electrical listening device" operated at 70 cm (430 MHz) and used pulsed transmission at an RPF of 10 kHz. A transmit-receive blocking circuit was developed to allow a common antenna. The received signal was displayed on a CR tube with a circular time base. This set was demonstrated to the Army in April 1938 and detected an aircraft at a range of 18 km (11 mi). An Army general **was not convinced about the operational use**, however, because it could not withstand the harsh environment of Army combat conditions.

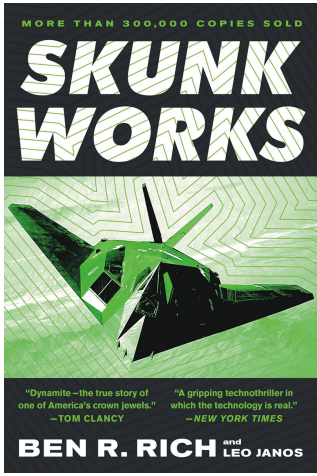
Nevertheless, funding was provided for final production of the "M39", and Max Staal was added to the team. To maintain secrecy, the production was assigned to different organizations: The transmitter was built at the Delft Technical College and the receiver at the University of Leiden. The mechanical construction was built by van Heijst in The Hague. Ten sets would be assembled under the personal supervision of J.J.A. Schagen van Leeuwen, head of the firm Hazemeijer Fabriek van Signaalapparaten.The Dutch electric listening device

Philips -> Delft + Leiden

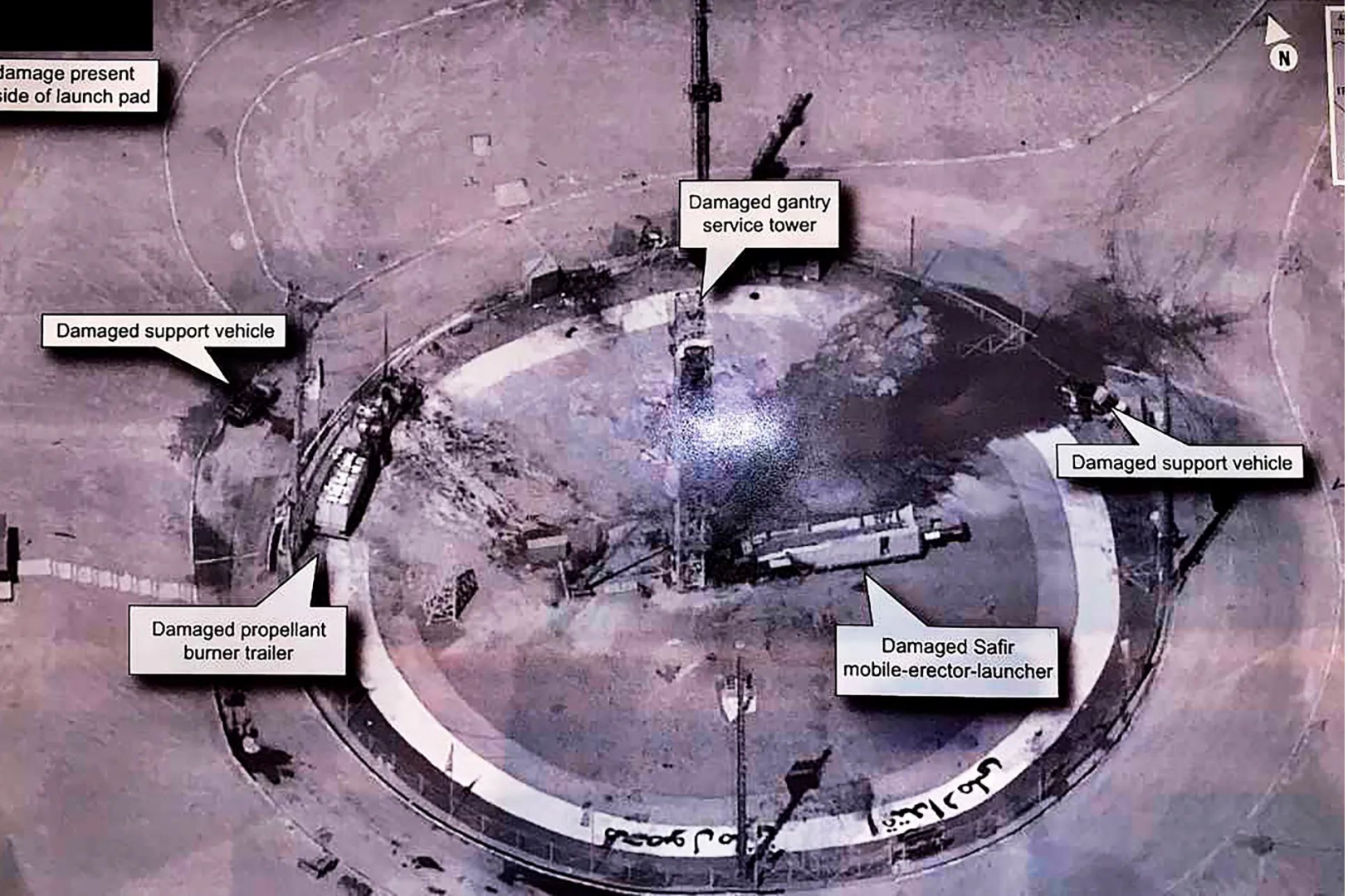
“Artist impression”



Пётр Я́ковлевич Уфи́мцев,
Various Soviet academic institutes



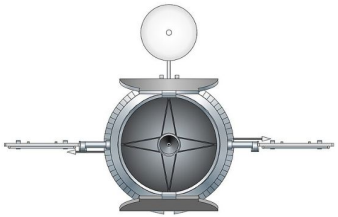
Lockheed


damage present
side of launch pad
N
Damaged gantry
service tower
Damaged support vehicle
Damaged support vehicle
Damaged propellant
burner trailer
Damaged Safir
mobile-erector-launcher

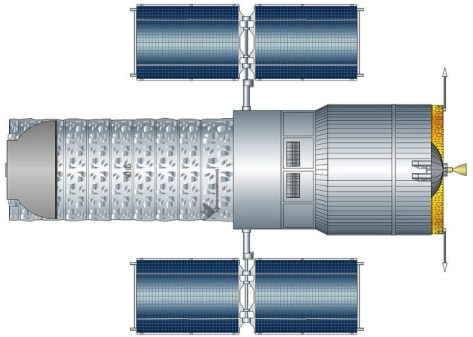
10cm/pixel

“In discussing the reasons for switching Hubble from a 3-meter main mirror to a 2.4-meter (94 in) design, states: "In addition, changing to a 2.4-meter mirror would lessen fabrication costs by using manufacturing technologies developed for military spy satellites".

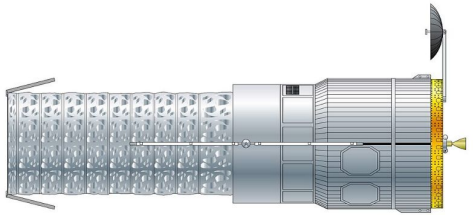
KH-11 KENNEN
(Conceptual layout based upon HST design)



FRONT VIEW



TOP VIEW

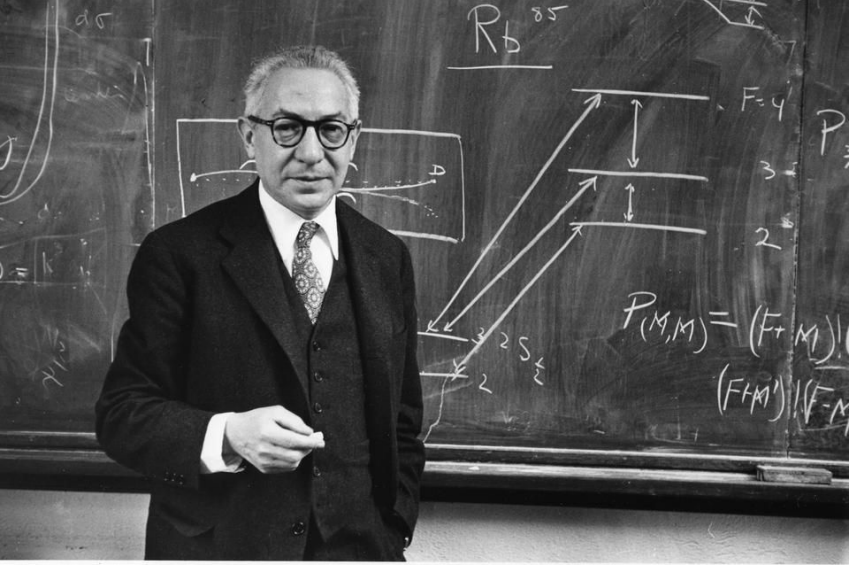


SIDE VIEW

Human Figure
(To Scale)

In January 2011, NRO donated to NASA two space Optical Telescope Assemblies with 2.4 meters (94 in) diameter primary mirrors, similar in size to the Hubble Space Telescope, yet with steerable secondary mirrors and shorter focal length (resulting in a wider field of view).

“Thank you, Military Industrial Complex!”



Photograph by Dan Weiner; copyright John Broderick

For the specific geometry of the Galileo constellation, the maximum Sagnac effect is about 153 ns for a user receiver stationary on the ground.

It is worth noting that the gravitational effect is by far the largest of all relativistic effects: more than six times larger than the speed effect and two orders of magnitude larger than the Sagnac effect. General relativity, in other words, dominates over special relativity, as far as GNSS relativistic effects are concerned.

There is also a periodic relativistic frequency shift due to the orbit eccentricity, the corresponding time correction is given by the following equation (as expressed both in [2] and [12]):

$$\Delta t_r = \frac{2\sqrt{GM_E}}{c^2} e\sqrt{A}\sin E \qquad (5)$$

where

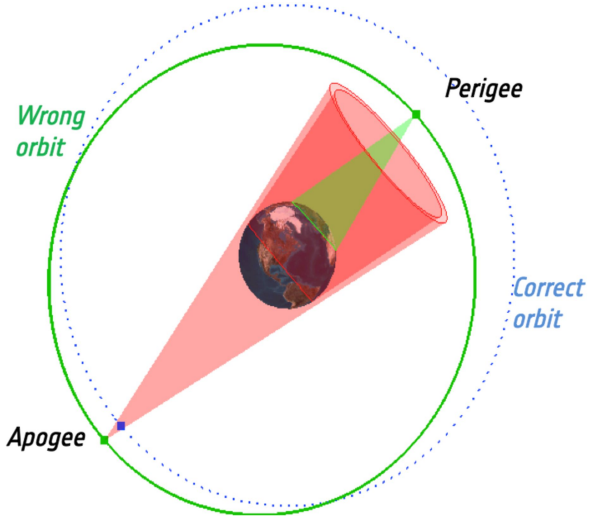
- e is the eccentricity of the satellite orbit,
- A is the semi-major axis of the satellite orbit, and
- E is the eccentric anomaly of the satellite orbit.

Galileo satellites prove Einstein's Relativity Theory to highest accuracy yet

04/12/2018 20289 VIEWS 153 LIKES

ESA / Applications / Satellite navigation

Europe's Galileo satellite navigation system – already serving users globally – has now provided a historic service to the physics community worldwide, enabling the most accurate measurement ever made of how shifts in gravity alter the passing of time, a key element of Einstein's Theory of General Relativity.



TU Delfts Dr. Strangelove

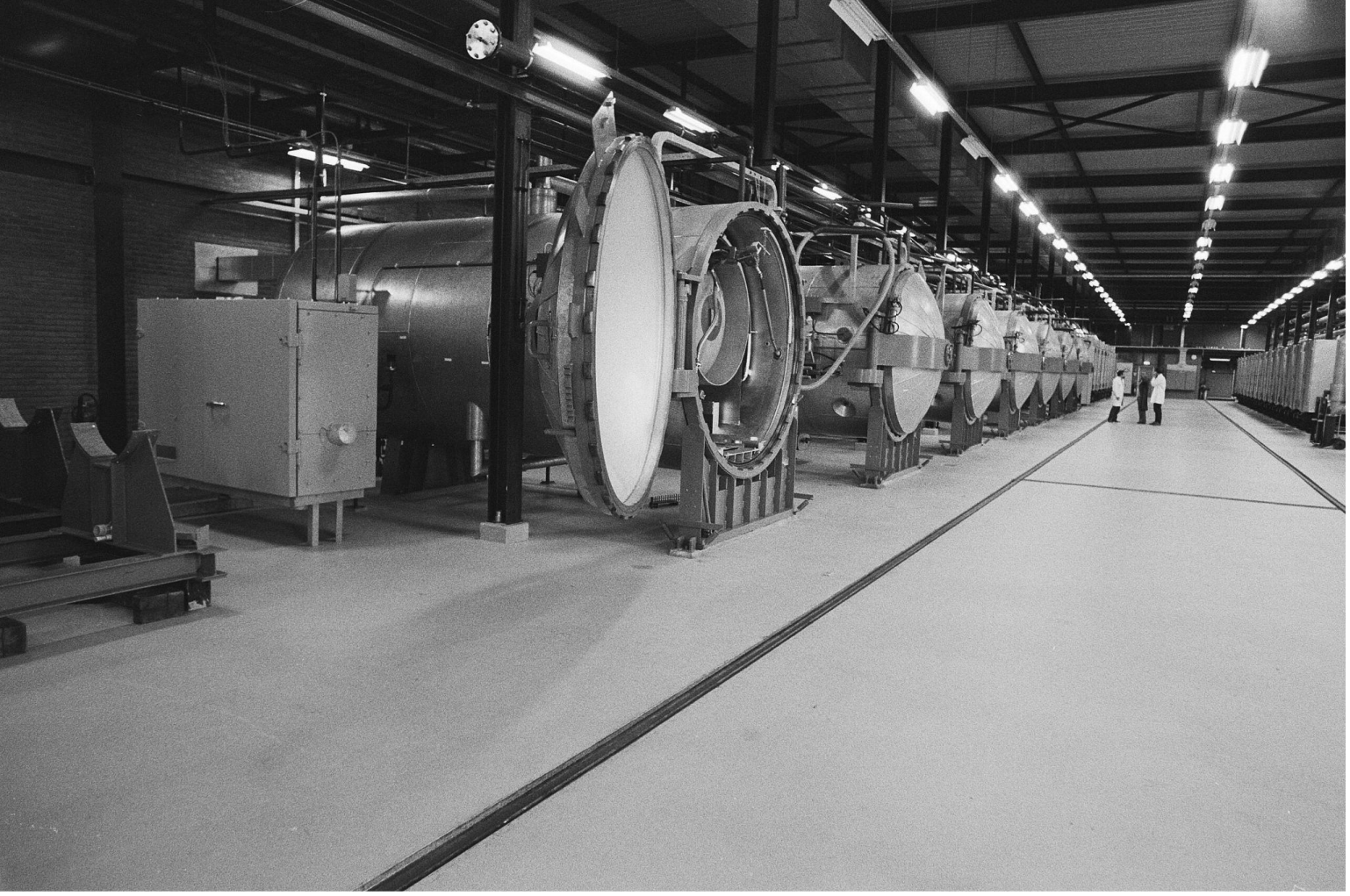
Dr. Abdul Qadeer Khan is arguably TU Delft%s most famous (or infamous) alumnus. Khan received a MSc degree in metallurgy from Delft in 1967 and later stole nuclear secrets from his Dutch employer, helping Pakistan develop its first nuclear bomb.

REDACTIE 11 SEPTEMBER 2002 22:00

Post-9/11, should foreign students be trusted with dual-use technology?

Long celebrated as the "Father of Pakistan's Nuclear Bomb", Dr A. Q. Khan's rags to scientific riches life story should inspire all those patriotic foreign students who believe the geopolitical ends justify the means%in this case, nuclear espionage.

Khan, 66, who was born to a modest family in present day India in 1936, migrated to Pakistan in 1952, following millions of other Muslims who left India when the subcontinent was partitioned. After graduating from school in Karachi, Khan went to Europe in 1961 to continue his studies. First in Germany, at the *Technische Universität* of West Berlin, then at TU Delft, where he received a MSc degree in metallurgical engineering in 1967, before finally earning a Ph.D. in metallurgy from the Catholic University of Leuven (Belgium) in 1972. Khan then went to work for Physical Dynamics Research Laboratory (FDO), in Amsterdam, a period of employment that would later become the basis of his trial and conviction (in absentia) in the Netherlands on espionage charges.



Universiteiten

↓

Fysisch Dynamisch Onderzoekslab Stork (FDO)

↓

Urenco

↓

Pakistan, Noord-Korea, Libië

…

Wassenaar Arrangement

on

Export Controls for Conventional Arms and Dual-Use Goods and Technologies

2. *For the purposes of 5.A.2.a., 'described security algorithm' means any of the following:*
   a. *A 'symmetric algorithm' employing a key length in excess of 56 bits, not including parity bits;*

      Technical Notes

      For the purposes of 5.A.2.a. Technical Note 2.a.:

      1. *'Symmetric algorithm' is a cryptographic algorithm using an identical key for both encryption and decryption.*
      2. *A common use of 'symmetric algorithms' is confidentiality of data.*

   b. *An "asymmetric algorithm" where the security of the algorithm is based on any of the following:*
      1. *Factorisation of integers in excess of 512 bits (e.g., RSA);*
      2. *Computation of discrete logarithms in a multiplicative group of a finite field of size greater than 512 bits (e.g., Diffie-Hellman over Z/pZ); or*
      3. *Discrete logarithms in a group other than mentioned in paragraph b.2. in excess of 112 bits (e.g., Diffie-Hellman over an elliptic curve); or*

56 bits???

“Us, with the special technology”

- Australia
- Belgium
- Canada
- Denmark
- France
- Germany
- Greece
- Italy
- Japan
- Luxembourg
- Netherlands
- Norway
- Portugal
- Spain
- Turkey
- United Kingdom
- United States

We did care

Wars are won using science,engineering, and technology

We can’t neglect this stuff!

RESEARCH , THE UNIVERSITY 11/06/2024

162 people at TU/e have ties to (very) high-risk universities in China

KONINKLIJKE NEDERLANDSE
AKADEMIE VAN WETENSCHAPPEN

KNOWLEDGE SECURITY

Academy Position Paper

"The undesirable transfer of knowledge, i.e. the transfer of knowledge and technologies that may pose a threat to national security."

Stg Zeer Geheim

- No phones!
- No social media!
- No foreigners!
  - Or perhaps with great trouble
- No daylight!
- No visitors!
- Difficult & rare buildings
- No telling people what you do!
- No job prospects!

Prime minister faces fire risk fine if he does not move office

July 29, 2024

Photo: DutchNews.nl

According to the state property service, Schoof and his ministerial team are willing to leave, but can't because of computer security issues. **In particular, the special system "used to store state secrets" is not yet working**, broadcaster NOS said.

▸ Materials (Basel). 2015 Mar 11;8(3):1027–1042. doi: 10.3390/ma8031027

Precursor-Less Coating of Nanoparticles in the Gas Phase

Tobias V Pfeiffer [1,*], Puneet [redacted], Maria E Messing [2], Mario Valvo [3], Andreas Schmidt-Ott [1,*]

Puneet [redacted]

[1]Faculty of Applied Sciences, Delft University of Technology, Julianalaan 136, Delft 2628 BL, The Netherlands; E-Mail: puneet[redacted]@gmail.com

Find articles by Puneet [redacted]

This article introduces a continuous, gas-phase method for depositing thin metallic coatings onto (nano)particles using a type of physical vapor deposition (PVD) at ambient pressure and temperature. An aerosol of core particles is mixed with a metal vapor cloud formed by spark ablation by passing the aerosol through the spark zone using a hollow electrode configuration.

1) Universities are DESIGNED and PUSHED to publish and promote their inventions

2) Academic institutions have very weak control over their researchers
   a) Often don't even know precisely who those are!

3) Academics barely have a distinction between their work and private lives

4) There is NO infrastructure for keeping secrets within academia. Also, researchers typically use their own stuff (gmail. Dropbox, slack, onedrive..)

5) There is no classified data organization, no personnel support

6) There is NO MONEY for anything like that

7) **Academics are uniquely vulnerable on 3 of the dimensions of espionage: "MICE"**

GPS	Relativity, atomic clocks from academia. Productization NIST/US Government labs → Industry
Penicillin	Hospital → Academia → US government labs / Pfizer
Stealth	Soviet Academia → US Airforce Intelligence → Lockheed Martin
Atomic bomb	Generic academia → Los Alamos Labs → Pantex
Space optical	No clear origin in academia, did return lovely mirrors
Encryption	Discrete mathematics → Ministries of defence → Industry
Enigma/ Bombe	Poznań University and Polish General Staff's Cipher Bureau Cambridge / Princeton → UK Government
Rockets	Princeton → German Nazi Waffenamt → US Government → Contractors
Uranium Centrifuges	Various universities → FDO STORK / Urenco → Pakistan, North Korea, Libya...

Our real defense improvements did not come from universities directly.

Which is good since they aren’t set up for that anyhow.

From Termination Shock, Neal Stephenson

"That's for sure," Bo said.

"Why are you here *today*?" Willem asked. "Why bother coming to the Netherlands?"

"Observation. Fact-finding," Bo said. "Among other things it is an opportunity to see how your country responds to a once-in-a-lifetime storm."

Willem didn't catch the reference. "You mean what happened at Scheveningen?"

Bo seemed nonplussed. "No, I'm talking about the one in three weeks."

"We can't forecast three weeks out!"

"We can."


AI Drones?
Power efficiency?
Better batteries?
Thinner fibers?
Better positioning?

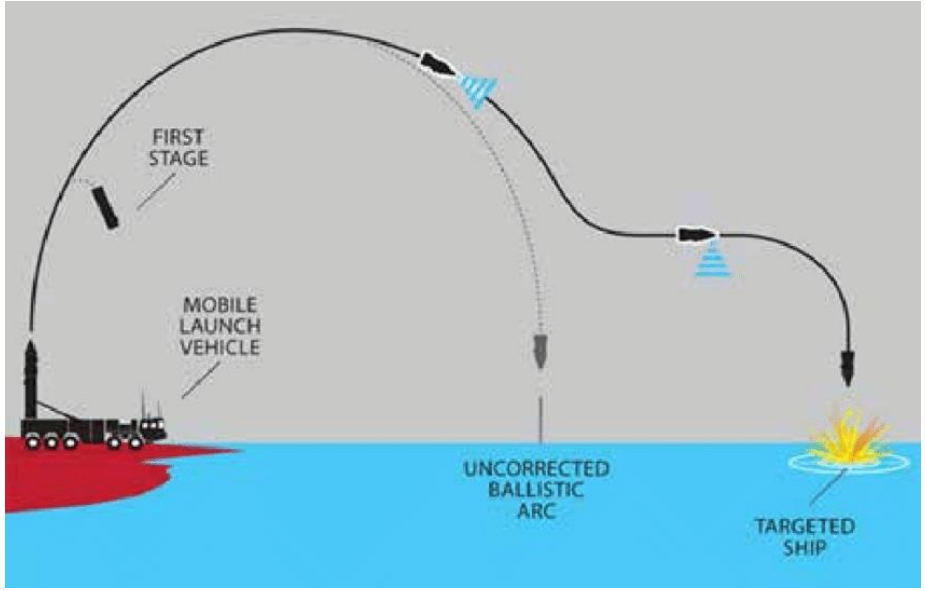
The European machines that make the most energy efficient chips

ZEISS

TRUMPF

imec

The anti-ship ballistic missile



“The idea that **submarines loitering in the depths are undetectable is fundamental** to modern nuclear deterrence. America, Britain, China, France, India, Israel and Russia act on the basis that though a nuclear-armed adversary could conceivably destroy their land-based forces in a first strike, **it could not wipe out their submarines**”

“Thanks to something called the **Debye effect**, it might be possible to hunt submarines using the magnetic signatures of their wakes.”

“Work done in Russia, whose navy has long been interested in alternatives to sonar, suggests the Debye effect can be turned into something quite potent.”

“a new generation of high-tech magnetic sensors based on machines called SQUIDs—superconducting quantum interference devices—should be more sensitive than existing ones”

Journal of Electrotechnology, Electrical Engineering and Management (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/jeeem.2024.070308
ISSN 2560-6697 Vol. 7 Num. 3

Feasibility Analysis of Submarine Debye Effect Magnetic Field Detection Based on Fluent

Weiyi Du[1]

[1]*Shenyang Ligong University, Shenyang, China*

Who is going to do the work?
Not suitable for current universities

Too big for startups

“Big defence” is too slow & expensive
(and they are not alone)

Seven Sons of National Defence

Article Talk

From Wikipedia, the free encyclopedia

The **Seven Sons of National Defence** (Chinese: 国防七子) is a grouping of the public universities affiliated with the Ministry of Industry and Information Technology of China.[1][2] They are widely believed to have close scientific research partnerships and projects with the People's Liberation Army.[3][4] However, these are not official part of the Academic institutions of the Chinese armed forces.

Universities [edit]

The universities of the Seven Sons of National Defence include:[5]

- Beihang University in Haidian, Beijing
- Beijing Institute of Technology in Haidian, Beijing
- Harbin Engineering University in Harbin, Heilongjiang
- Harbin Institute of Technology in Harbin, Heilongjiang
- Nanjing University of Aeronautics and Astronautics in Nanjing, Jiangsu
- Nanjing University of Science and Technology in Nanjing, Jiangsu
- Northwestern Polytechnical University in Xi'an, Shaanxi

“In 2020, the United States government banned students from the Seven Sons schools to study in graduate programs in the United States”

“Should be big enough to set something up…”

“The plan seeks to mobilize up to €800 billion to strengthen Europe's defense infrastructure in response to geopolitical threats”

Maybe do some research too!

Dozens of millions of euros (thanks)

I miss places like Philips NatLab, Fysisch Dynamisch Onderzoekslaboratorium….

Summarizing:

- Without scientific and engineering advances we get no new technology
- Without new technology we become vulnerable, and we definitely can't win wars
  - Despite what some people say, this is bad
- Much defense technology has led to practical and even scientific progress
- **Universities do not have <u>secret</u> knowledge to protect, and they can't protect them (and perhaps should not)**
- We currently do not have great paths for "defence innovation"
- There is money on the table
- I miss research labs..

- Making of the Atomic Bomb
- Ballistic Missile Defense
- Skunk Works
- The Cardinal of the Kremlin (FICTION!)
- Seizing the Enigma
- Splijtstof
- The Idea Factory: Bell Labs and the Great Age of American Innovation
- Termination Shock

Security of Science

https://berthub.eu/vvtp - https://berthub.eu/

bert@hubertnet.nl