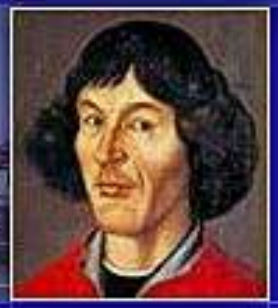
NICOLAUS COPERNICUS UNIVERSITY



- **The Nicholas Copernicus University (NCU) is the biggest university in northern Poland. In the academic year 2006/2007 approximately 40.000 students were studying more than 100 specialisations in 53 different subject areas and 50 kinds of postgraduate studies.**

- **The NCU employs a total staff of about 4100, of whom 2100 are academic teachers working at 14 faculties, among them 252 are full professors.**

- **The Education of Physics Division group is responsible for teacher's training at the Institute of Physics, which is a part of the Faculty of Physics, Astronomy and Applied Informatics.**

Division of Physics and Astronomy Education Group

Dr. Józefina Turlo – creator of group, Prof. Grzegorz Karwasz, Dr. Katarzyna Przegiętka, Dr. Grzegorz Osiński, MSc. Andrzej Karbowski, MSc. Krzysztof Służewski

Prof. Andrzej Bielski - member of History of Science and Technology Committee at the Polish Academy of Sciences (translation to the VITELLO Books from XIII c - PERSPECTIVA)

Prof. Andrzej Wroblewski- Warsaw University- expert, Author of „History of Physics”

Dr. Jozefina Turlo experience and activities

- **Membership of the professional bodies:**
  - International Research Group on Physics Teaching - GIREP,
  - Polish Physical Society (PTF) - the chairman of the Committee on the Educational Awards,
  - Maria Sklodowska-Curie in Tribute Society (MSCTS),
  - Polish Association of Science Teachers – PA of ST (v-ce Pres).

- **Other skills (e.g. Computer literacy, etc.):**
  - Editor of many international and Polish booklets, journals and educational materials.
  - Computer literacy – author of many lectures and workshops, concerned with ICT application in science education and with the use of historical experiments in science teaching.

Dr. Jozefina Turlo experience and activities

- **Present positions:**
  - University teacher - senior lecturer on physics and astronomy education, head of Physics Education Laboratory (1982-2007).
  - The Polish Ministry of Education Expert (referee) on physics textbooks and educational aids.
  - The editor in chief of the Polish Journal "Science Teaching".
  - Polish co-ordinator of the intern. programme "Science Across Europe".
  - The Member of the Nuffield Foundation Group working on "Science Education in Europe 16-19".

  For many years we were collaborating with science teachers (recently with the network of teachers), as the result editing many books, booklets and educational materials.

- **Others:**

  Contracting and co-ordinating many projects as:
  PHARE TESSA and TEMPUS, EU SOCRATES: STEDE, EUCISE, TEWISE, GRUNDTVIG, AIDA, TFPC, EU-TRAIN, EU-ISE, EU-HOU, RADONET and MINI- SCIENCE LAB.

Dr. Jozefina Turlo experience and activities

- **International and National Conferences, Seminars and Workshops**
  Active participation in preparation of educational TV programs within the VIDEO-SCHOOL series, exhibitions of didactic aids and various demonstrations of physics experiments (including historical ones) for teachers and school students.
  http://www.fizyka.umk.pl/phys/ZAKLADY/PDF/Historyczne_scenariusz_2006/index.html

Dr. Jozefina Turlo experience and activities

- **International and National Conferences and Seminars:**

- Organisation of the intern. and national conferences and workshops as: GIREP '91 on "Teaching about reference frames: from Copernicus to Einstein";
- „Computer aided experiments in physics education", 1993-2007;
- "Science and mathematics teaching for the information society", 2000;
- Polish Association of Science Teacher's annual meetings, 1994-2007;
- "Using Historical Physics Experiments in Physics Education", 1999-2006, during Science and Art Festivals in Torun.
- Collaboration with science education EU researches within the TEMPUS being the contractor and co-ordinator of JEP-12267 project on: *"Modernisation of two-subject science and mathematics teacher education"*
- Collaboration with XLAB Getynga.

Key references on the topic of project

1. At the page: www.fizyka.umk.pl/~pdf you can find the list of J. Turlo 144 selected publication since 1989 (32 book editions, incl. Proc. from the organised by us conferences), but related to the project's topic:
2. F. Riess, in Proc. Science and Mathematics Teaching for the Information Society, ed. J. Turlo, Historical Experiments – a modern approach to physics teaching, Torun, 2000, pp. 41-52.
3. J. Turło, ed.& co-author, *Historical Experiments in Teaching Physics*, TopKurier, Torun 2002, 99p.
4. J. Turło, K Służewski, J. Rybicki, A. Karbowski, *Examples of Historical Experiments in Physics Teaching,* Physics at School (in Polish), v. 262, 2002, p. 62-72.
5. J. Turło, K Służewski, A. Karbowski, G. Osiński, *Examples of Historical Experiments in Teachers Traning,Proc. of V Meeting of Physics Experiments Demonstrations* Wroclaw and A. Mickiewicz University Science Festival, Poznan (2005),

Key references on the topic of project

6. J. Turło, ed., *Science Teacher Education in Some EU Countries*, TopKurier, Torun, 2000, 135 p.
7. J. Turło, *Modernisation of Two-subject Physics and Mathematics Teacher Education*, Physics Teacher Education Beyond 2000, Ed. R. Pinto, S. Surinach, Elsevier, 2001, 401.
8. J.Turło, K. Przegiętka, *The interdisciplinary genius of Maria Sklodowska-Curie inspiring an original and attractive science teaching method,* Proc. of GIREP 2004 Conference "Teaching and learning Physics in new context", Ostrava 2004, 161.
9. J.Turlo, *Learning To Teach Physics from Lessons of Maria Skłodowska-Curie,* Proc. GIREP 2006 Conf. in Ljubljana 2005– Informal Learning and Public Understanding of Physics, 317-322.
10. A. Karbowski, G. Karwasz, *Kopernik, Doppler, Michelson and Cosmology,* Proc. of GIREP 2007 Conf., Opatija.

Proposed resources

1. Collaboration with the Nicoalus Copernicus Museum, Regional and University Museums in Torun (exhibitions, e.g. Optics in May 2008)
   http://www.muzeum.torun.pl/index.php?aid=1132648237438 2d72d35c71
   http://www.muzeum.torun.pl
2. J. Turło, E. Dąbkowska, K. Służewski, A. Karbowski, G. Osiński, K. Przegiętka, *How experiments were performed formerly? From Vitello to Foucault'a, textbook for teachers,* UMK 2006, 20 p.
   http://www.fizyka.umk.pl/phys/ZAKLADY/PDF/Historyczne_scenariusz_2006/index.html
3. Copernicus, Michelson and our place in the Universe
   http://dydaktyka.fizyka.umk.pl/Kopernik_Michelson.html
4. How Maria Sklodowska-Curie was teaching physics?
   http://www.fizyka.umk.pl/phys/ZAKLADY/PDF/materialy/MSC.html?
5. On the track of Modern Physics – *Materials of EU Science & Society Project*

Examples of resources

Maria Sklodowska-Curie as physics teacher in a class of students at 12 years old

- 1907 – creation the Society of Scientists for Experimental Teaching.

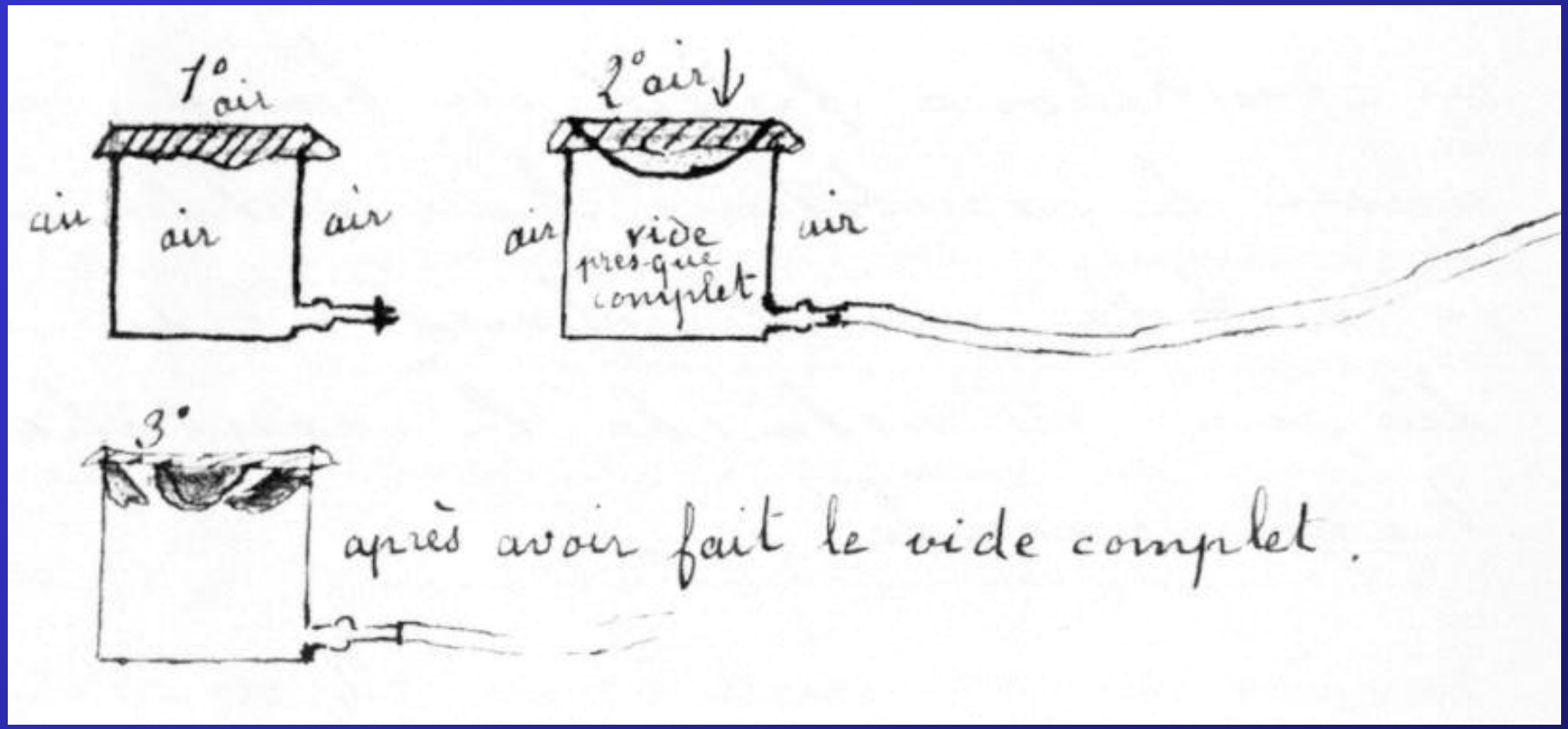
Teachers:
Maria Sklodowska-Curie - physics,
Jean Perrin - chemistry,
Pierre Langevin - mathematics,
Henri Mouton - science,
Henrietta Perrin - French, history,
Alice Chavannes - English, German, geography,
Jean Magrou - drawing.

- 2003 - publication of 10 physics lessons notes of Maria Sklodowska-Curie by Isabelle Chavannes in Paris.

Examples of some experiments

The air inside of dried pig blister.

Examples of some experiments



The original drawing of Isabelle Chavannes showing 3 stages of experiment with destroying the piece of blister on the top of the glass chamber.

Actors in action

Students are trying to separate two Magdeburg hemispheres

Actors in action

Pierre Hadamard is performing experiment using overflow dish

5.+Jozefina+(28042003).lrc - Classroom Player

LearnLinc Class...

File Run Tools Help

Conferencing

Jozefina Turlo

Mute

People

Name

Jozefina Turlo
Kai Pata
Krzysztof Sluzewski
Roser Pinto
Sindy Meleady
Ton Ellermeijer
Vincent Dorenbos

0 7

Agenda

Feedback

Faster
Perfect
Slower
Please Review

Text Chat

Ton Ellermeijer: yes
Sindy Meleady: yes
Vincent Dorenbos: hello Roser!
Vincent Dorenbos: Do you also see the questions?
Roser Pinto: hello, I'm Marc on behalf of Roser Pinto.
Roser Pinto: yes

Private

Sklodowska - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://www.phys.uni.torun.pl/~pdf/Sklodowska.html Go

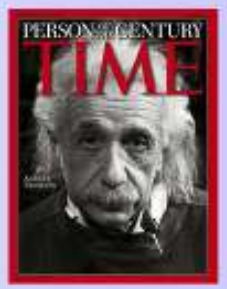
Copernic Agent The Web Up History Highlight

1896 - Henri Becquerel - discovery of radioactivity
1898 - M. Sklodowska-Curie - discovery of polonium and radium

Maria Sklodowska-Curie in laboratory

On the Track of Modern Physics

XX Century = Einstein century



Albert and Mileva

Albert, as said by his two years younger sister Maja, **learned to speak quite late**. He used to „drawl" sentences like contemplating them. The mother, Paulina taught him to play cello, his uncle Jacob taught him algebra and an older friend, a medicine student, used to borrow him popular-science books. At age of 15, he studied by himself differential calculus.

When Albert was one year old, his father's company was to bankrupt, so the family moved from Ulm to München. Bismarck's scholastic system, closed-minded teachers and studying as a duty, changed the school into a nightmare. In Italy, where the father moved just before Albert's graduation, **he revived**.

His parents wanted him to study at the Polytechnic in Zurich – the best high school outside Germany. Without *Abitur* he **had to pass** the admission exams. He fell in German and philosophy. Following Rector's advice, Albert stayed one year in Switzerland, where he finally got *Abitur*. But against his father's will, Albert decided to become a scientist, not an engineer.

Once more Albert did not obey his father: when he got in love with Mileva Maric, a student of mathematics from Serbia (under Austria at that time). In 1901 they had a daughter who (probably) died. Mileva failed her graduation exams and stayed without job. The university research position, promised to him, went to another person: Albert also stayed **without a job**. Only after his father death, Albert married to Mileva. In 1904 their first son was born. Albert's friend found him a work in Bern as a patent adviser. In a short time, till 1906, Albert published 6 works.

In 1908 he got a „Privatdozent" at Bern University and a year later an associated professorship of Zurich Polytechnics. This position was offered to his friend Fridrich Adler – a faithful socialist who recognized that **Einstein was better**.

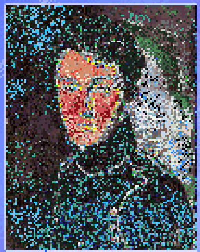
Marriage with Mileva was a **marriage in love**. Albert wrote to Mileva with tenderness „my little doll", and about the relativity theory he wrote „our theory". In summer 1914, short before the war, Mileva left Berlin and came back with children to Zurich. Albert, with a friend, published a pacifistic „Manifest to Europeans" – what made him isolated inside the university staff.

Four manuscripts that changed the world

In 1905 A. Einstein, a technical expert of 3rd level in the Swiss Bureau of Patents published in the 17th volume of the "Annalen der Physik" three articles, written in four

On the Track of Modern Physics

Chaud ou froid?

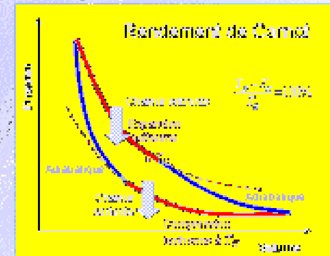


Sadi-Nicolas Carnot, fils d'un générale mourut de choléra à 36 ans. Son seul travail *Reflexions sur la puissance motrice du feu et sur les machines propres à développer cette puissance* jeta le bases de la thermodynamique.

Une conclusion importante de l'analyse du cycle de Carnot c'est que le rendement théorique maximum des moteurs à chaleur est directement lié à :

rendement = $(T_H - T_C)/T_H$

Le cycle de Carnot est une idéalisation, puisque aucun processus d'un moteur réel est réversible et tout processus physique implique une petite « perte d'énergie » dite entropie.

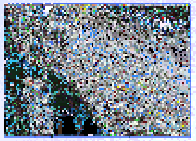


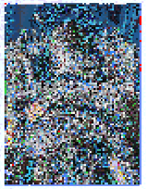
Le cycle de Carnot en forme graphique a été introduit par Emile Clapeyron en 1834.

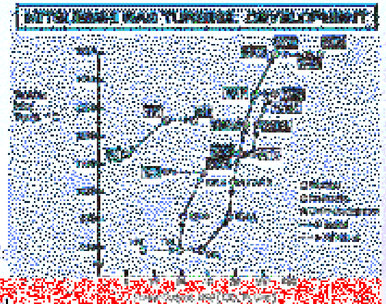
Pour tout processus irréversible, le rendement est plus petit que celui du cycle de Carnot. Cela peut être associé avec un flux de chaleur plus petit vers le système ou un flux plus grand sortant du système. Le résultat inévitable est l'inégalité de Clausius.

$$\oint \frac{dQ}{T} \leq 0$$

À plein gaz





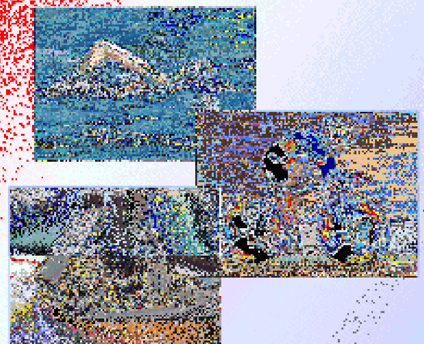


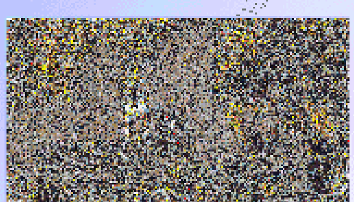
La seule méthode pour "contourner" la lois de Carnot c'est d'augmenter la température de combustion (en utilisant des nouveaux matériaux pour les turbines). À températures de 1300°C rendements d'à peu près 40% peuvent être atteints.

Selection de rendements

pic de rendement des action ou des outils(%)	
homme, nager, surface	2
homme, nager, sous la surface	4
humain, déblayer	3
moteur à vapeur	17
homme, vélo	25
moteur à essence	30
turbine à gaz naturel	40
contractions musculaires	50
turbine couplée (gaz-vapeur)	60
celles à combustible	60
moteur électrique	80
turbine couplée chaleur-puissance	95

http://hypertextbook.com/physics/thermal/engines/



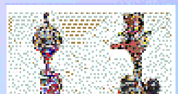


En 1769, le tout premier véhicule à propulsion autonome était un tracteur militaire inventé par un ingénieur et mécanicien français, Nicolas Joseph Cugnot (1725 - 1804). Cugnot utilisa un moteur à vapeur pour alimenter son véhicule, construit en suivant ses instructions à l'Arsenale de Paris par le mécanicien Brezin. Il a été utilisé par l'Armée

Le silencieux Stirling

Parfois c'est important d'utiliser des petites différences de température. L'invention du pasteur écossais Robert Stirling est doté de deux pistons et utilise soit le réchauffement soit le refroidissement d'un gaz. Il atteint un rendement jusqu'au 40%.

Ces deux moteurs à droite ont besoin d'une différence



Our wishes

1. Historical instruments (Vitelo, Copernicus) for the Interactive Museum of Science and Technology in Toruń (and HIPST Project)
2. The elements of history and philosphy of science included to the teacher training (postgraduate cources) and school science curricula.
3. Internet comprehensive library of educational resources related to HIPS available for science teachers and students in Poland.
4. Implementation of history and philosophy of science issue as the topics of our Faculty regular Seminars for science teachers.

Thank you for your attention!