Minutes from the National Meeting Poland, 2010

According to the National Work Plan we have organised the Third HIPST National Meeting on 19th. June 2009 in Torun. This Meeting has been attended by 32 participants from the Local Kujawsko-Pomorski Region, but also from different parts of Poland as Zachodnio-Pomorski, Wielkopolski and Mazurian districts.

The schedule of this meeting was as follows:

Schedule of the III National HIPST Seminar Meeting
19th June 2010, Torun, PL

1. 10:00 – 10:30 - Registration, coffee, tea
2. 10:30 – 11:30 - Lecture of Professor Andrzej Bielski (Institute of Physics, NCU): *As in the Middle Ages argues the fundamental laws of optics? Demonstrations.*
3. 11:30 –12:30 - Lecture of Dr. Michał Targowski (Faculty of History NCU) *Nicolaus Copernicus Thorunensis New, special, dedicated to the Nicolaus Copernicus Website: (http://copernicus.torun.pl)*
4. 12.30-13.10 – Lecture of Dr. Józefina Turło (Institute of Physics, NCU) *Introduction to the lessons based on the Case studies of Torun HIPST Project*
5. 13:15 – 14.15 - Lunch
6. 14:15 – 16:30 Presentations of "Case studies":
   a) Justyna Chojnacka „*Witelo's studies on rectilinear propagation of light*"
   b) - Magdalena Czerwińska, „*The contribution of Nicolaus Copernicus observations to the reform of calendar*",
      - Dr Ewa Strugała, advisor of teachers- A*astronomical table of M. Copernicus*
      - prrformed by students from VI Higher secondary school in Poznań,
      - Karol Czarnecki, student - A*astronomical table of M. Copernicus performed* by his colleagues from Higher secondary school in Swinoujscie.
   c) Marek Szablewski, Janusz Kosicki, Dawid Basak, „*Telescope at school, that is as to be Galileo...*"
   d) Janusz Kosicki, "*The glasses as a simple optical instruments or from what it started...*"
   e) Magdalena Sadowska, "*Optical microscopes since the first to the contemporary one*"
7. 16:30 – 16.45 – Coffee, tea
8. 16:45 – 17:30 – Discussion in groups *("Reflection corner")*
9. 17:30 – 18:00 – Summary and Conclusions
10. 19:00 – Seminar Dinner

Some participants of the Seminar in front of t the Institute of Physics

After introduction by Dr. Józefina Turło, the Member of the History of Science Commission of the Polish Academy of Sciences - **Professor Andrzej Bielski** has given interesting Lecture on: *How in the Middle Ages argued the fundamental laws of optics? Demonstrations.* This Lecture was supported by on-line demonstrations with the use of replicas of Witelo's instruments devoted to the studies of rectilinear propagation of light, reflection of light and to drawing of the conical curves.

However, in conjunction with often emerging question of the authenticity of Witelo basic discoveries made in the thirteenth century, professor had decided to say something more about Witelo himself and to cite several arguments for this, that work of Witelo "Perspective" was not plagiarism.

Witelo writes about himself - Thuringorum et Polonorum filius (son of Thuringia and Poland). His father was a colonial of Thuringia (maybe Slav?) and his mother – Silesian women. He was born around 1237, and died after 1281.

Works, that have survived to our times:

– A letter written in Viterbo (Italy) to the parish priest Lous in Silesian Lwowek: *De causa primaria poenitentiae in huminibus et de nature demonum* (The primary cause of human grief and the nature of demons).

– *Perspective.*

Works, which have been lost:

- *De ordine entium* – (On the order of entities)

- *De elementis conclusionis* (The main findings)
- *Philosophia naturalis*– (Natural Philosophy)
- *Sciencia motuum coelestium* (Learning about the movements of celestial bodies)
- *Naturales unimae passiones* (Natural phenomena of the soul)
- *De partis Universi* (The parts of the Universe) - this is a letter sent to friends in Silesia.

About missing treaties we learn from the mentions in *the De causa* ... and *Perspective*.

Some details on *Perspective*

Work, which brought fame to Witelo is *Perspective. Perspective* was written probably between 1269 - 1273rd It provides the full exposition of the medieval optics. Its importance is best demonstrated by the fact, that the 23 manuscripts were preserved. The oldest of the end of the thirteenth century. Moreover, two editions appeared in print:

– the first in 1535 in Nuremberg, prepared by J. Transtetter and P. Apian,

– second in 1572 in Basel, prepared by F. Risner and re-released in 1972 in a series of *The Source of Sciences* by Johnson Reprint Corporation, New York - London.

On the publication *Perspective* by Risner we have to stay longer. Risner wanted to give a full body of knowledge of optics and, therefore, in one volume posted three hearing of Arab scholar Ibn al - - Haytham from the ninth century (in the Latin world known as Alhazen) and Witelo *Perspective*, and the whole work titled::

Opticae thesaurus, Alhazeni Arabis libri septem, nunc primum editi, eiusdem liber De crepusculis et Nubium ascensionibus item Vitellonis Thuringipoloni libri X. Omnes instaurati, figuris illustrati et aucti, adiectis etiam in Alhazenum commentariis a Federico Risnero.

(Treasury of optical knowledge. Arab Alhazen seven books, now first published, and his work "At dusk" and "The rising clouds." Also ten books of Turingo – Pole – Witelo. All books were newly developed, illustrated with drawings and also be expanded with additional comments by Frideric Risner to Alhazen).

As is clear from the title, Risner decided to give the treasury of knowledge of optics (*Opticae thesaurus*). In the first place he placed the work of Alhazen and also added two other treatises by the same author, and then only was the *Perspective* of Witelo.

Risner preparing *Opticae thesaurus* made interference with the texts of the two authors, namely:

- In the text of Alhazen - added references to Witelo,
- In the text of Witelo - added references to ancient Alhazen and ancient authors (eg, Euclid).
- harmonize the drawings, giving them the sixteenth century provenance (eg, posted in the both works the sixteenth - century drawing of the eye).

Reviewing *Opticea thesaurus* we can easily get the impression, that the work of Witelo is plagiarism of Alhazen work, and so some critics of Witelo think. Meanwhile, none of them proved that treaties of Alchazen are completely original. Alhazen also benefited from the achievements of predecessors. References attached by Risner mean, that the relevant assertions are addressed the same issues. This does not mean, however, that Witelo not rewrited certain parts of the evidence from Alhazen. It should be noted, that Risner in the Foreword to *the Perspective* writes about the most interferences made by him. Please note, that the treaties of Alhazen occupy 288 pages of text, but *the Perspective* of Witelo - 474 pages!

We would like to add, that in the Middle Ages there was no obligation, and even the habit of quoting sources and **there was no concept of plagiarism!**. St. Bonaventure in the introduction to Commentary on *the Sentences* distinguishes four ways to write works:

"One - he says - rewrites the work of others, nothing not adding or changing to it, and this is known as an actor (actor) or scribe *(scriptor).* The second prescribed texts of others and adds something to them, but what is added, it is borrowed from others - this is called a compiler

(compiler). The third. in the work will be mixed others and his texts, but alien in it prevails. His own investigation is only the addition of someone else's idea, to bestow him as a commentator *(comentator*). Finally, the fourth writes his own texts and use the others' ideas, but his own prevails, and the text of others are only an addition to prove his own thoughts, and only the latter deserves the name of the author (*author)"*

Witelo should be classified to a group of commentators, and in fact his work is somethingin between a third and a fourth the above group. According to this classification, **Wielo has not committed plagiarism!**

Risner, despite his interference with the texts of the two authors, very highly valued Witelo, as in the preface to *the Perspective* writes:
"He put katoptrykę and mesoptykę in his own system, the most natural on the basis of their types and sorts and tidied up the whole discipline in a manner worthy of admiration. What more? If it were accept as the creator and author of the scientific discipline the Person, who gave optics form and spirit, Witelo should be regarded as the author of the science optics"

The role of *Perspective* in the development of optics had to be enormous, as Johannes Kepler title of his treaty with the optics, issued in 1604 (and therefore more than 300 years after writing *Perspective*) starts with the words:
"Ad Vitellionem Paralipomena ... "ie additives Vitelo ...

Later on **Dr. Michał Targowski** is an editor-in chief of recently created in Torun *the special website: (http://copernicus.torun.pl) .*
This website is available from February 19, 2010, online at: copernicus.torun.pl. The project was implemented jointly by the Nicholas Copernicus University in Torun and the Municipality of the City of Torun, in cooperation with the Institute of History of Science, Polish Academy of Sciences.

NICOLAUS COPERNICUS THORUNENSIS website is a place for the presentation of Copernicus's legacy in the form of digitized manuscripts *ARCHIVE* left by the astronomer, developed also in Latin transcription and translation. Posted on the Digital Library portal allows reading of ancient and contemporary publications on the life of Copernicus, its activities and importance. There is the *BIOGRAPHY* of astronomer. He cultivated the fields of *SCIENCE and DISCOVERY* and his reception in the modern world was described by specifically requested for the text of Portal well-known contemporary scholars.
The part *COPERNICAN REVOLUTION*- includes a richly illustrated texts devoted to the importance of the Copernican theory for the subsequent development of civilization. The reader can see the reception of the Copernican theory in the modern world and its importance for the development of science, especially astronomy and cosmology, and the humanities. It presents cosmological concepts developed after Copernicus and the history of world and Polish astronomy since Copernicus to the twentieth century.
Rich *GALLERY* contains a collection of diverse images of Copernicus and a collection of works of art, photos, videos and animation on his person or depicting places associated with the activities and objects bearing the astronomer today or in the past.
During the above Meeting our HIPST group was ask to collaborate with this WWW page editors. In the nearest future there will be also the English version of this website established.

In the next step of the Meeting there was a talk of **Dr. Józefina Turło** on: *Introduction to the lessons based on the Case studies of Torun HIPST Project.*
At the beginning, she tried to answer the question: "Why, especially in our global world we have to look for more effective methods of science teaching (including HIPST)?" As the factors influencing effectiveness of education she quoted among others: fiscal and other

resources, teachers quality, teachers competencies, students background (including their Science and Technological Literacy – STL), curriculum and instructional quality.

Later on, Dr.J. Turło has given arguments on "why working within HIPST project we selected optics?" There are as follows:

1. Collaborating with Professor Riess Group: „Higher School Didactics and History of physics" at the University of Oldenburg we reconstructed already some historical experiments (also from optics) and Regional Museum in Torun have collection of historical glasses.
2. We have access to the unique in Europe original materials of great scientists as Witelo (XIIIc.) and Copernicus (XV c.).
3. We are collaborating with astronomers within Faculty of Physics and Astronomy and with specialists of the bigest in Poland Astronomical Center, using optical instruments for observations.
4. Collaborating with teachers we identified the optics issues in Polish Core Curricula, where philosophy of HIPST should be implemented ***(see Report on „The place of HIPST in new Polish Core Curricula" (Eng.)***
5. We wish to present the variety of active methods of teaching as: hands – on experiments with the use of replicas, reproductions of famous historical investigations by inquiry method, play with instruments – constructions, watching films, using Internet, etc.
6. Our group have designed and realised in practise the exhibitions at museums on the "FIAT LUX – from Witelo to optical tomography" in: Regional Museums in Toruń (29.04-15.09.2008), Hevelianum Gdańsk (20.10.2008-15.02.2009), Planetarium in Olsztyn (01.03.2009 – 01.09.2009) Legnica (18.09.2009-30.11.2009), where Witelo was born and Sosnowiec..

After this, Dr. J. Turło has introduce the audience to the talks of the collaborating with her science teachers on the lessons based on Case studies from optics.
The following *Case studies* have been elaborated and used at schools:

1. *Witelo's studies on rectilinear propagation of light,* by Justyna Chojnacka..
2a. *The contribution of Nicolaus Copernicus observations to the reform of calendar,* by Magdalena Czerwińska.
2b. A*astronomical table of M. Copernicus* made by students from VI Higher secondary school in Poznań, by Dr. Ewa Strugała.
2c. A*astronomical table of M. Copernicus* performed by stydents from Higher secondary school in Swinoujscie, *by student of this School* - Karol Czarnecki.
3. *The telescopes at school, that is as to be Galileo…* by Marek Szablewski, Dawid Basak and Janusz Kosicki.
4. *The glasses as a simple optical instrument, or from what it started …*, by Janusz Kosicki.
5. *Optical microscopes from the first to the contemporary one,* by Magdalena Sadowska.

Finally, She presented the completed and modernised *Polish Web Page* http://hipst.fizyka.umk.pl, and has shown the *publications,* which are there results of our HIPST group (until now all together 13 papers.

In the next point of our Seminar the Toruń HIPST Partner collaborators: J. Chojnacka, M. Czerwińska, Dr. Krzysztof Rochowicz, Janusz Kosicki, Marek Szablewski, Dawid Basak and Janusz Kosicki were talked over their lessons based on Case studies in the form of ppt presentations and critically reflected on them.

In the second part of the Seminar the participants were divided into groups in which the discussion on the particular lessons took place. As an example we will report the discussion within the group on "Witelo and Copernicus lessons".

Group discussion of the "Case study":
Witelo studies on the rectilinear propagation of light

1. How the historical and philosophical contexts of Witelo's studies should be used to motivate students? Proposition of different methods and their applications.

a) methods

Activating method maybe used, such as: staging (master Witelo conversation with a student); problem (question) method, attempt to answer the question how light propagates in the homogeneous center, computer simulation of Witelo experiment.

b) to what extent?

During this lesson, using a replica of the Witelo instrument seems to be necessary. Modern methods of the rectilinear propagation of light observations (especially those using the laser beam) do not seem to implement the didactical function. Nevertheless, showing also, maybe not the latest but the achievements of modern technology is the responsibility of the contemporary school. During the lessons, the applications of the rectilinear propagation of light phenomenon in modern technology eg.: laser knifes, laser microscopes and laser levels, should be presented.

2. Would you like to present the historical aspects concerning Witelo's studies on rectilinear propagation of light in different way? How?

Attention should be paid on the time in which to Witelo lived (what he ate, drank, what tools were used in that time) as well as to describe his life in the historical background (how did Poland look like, to whom was Silesia belonging, who Witelo has the opportunity to meet, eg.: the Tartars, St. Thomas Aquinas and maybe other peoples or social groups that could have an impact on the Witelo research topics and his scientific views.

3. What you would like to change in work organization of work group elaborating "Case studies" (eg.: size of the group, scope of work, frequency of meeting, character of work, collaboration, payment)?

The working group is not large enough. One might be tried to increase the number of teachers participating in the project, to collaborate not only with teachers of physics, but also with teachers of history, philosophy, technical subjects, etc. The frequency of meetings and the scope of work are sufficient, not going outside the real capabilities of teachers.

4. What should be the means of the project results dissemination? (eg.: question of instruments – didactical aids, ppt presentations, open propositions – taking into account, circumstances of school, curriculum preferences of teachers).

The group discussion participants have proposed the following means of dissemination:

- the open lessons,
- the subject groups of interest in schools,
- forums for teachers,
- websites,
- blogs,
- symposiums, methodological conferences, subject journals.

Group discussion of the "Case study": *The contribution of Nicholas Copernicus observations to the calendar reform*

1. **How to use the historical and philosophical contexts of physical findings as a mean for motivation of students? How to combine common issues from different subjects?**
   a) methods
   - a trip to Olsztyn to see an astronomical table,
   - presentation of the era of Nicolaus Copernicus (eg.: ppt presentation, dresses, maps of the Region),
   - interdisciplinary, common article at the school website

   b) to what extent?
   - in the geography lessons – introduction of equinox and apparent motion of the Sun depending on the latitude,
   - in the history lessons - introduction of the political background of the Polish connection with Royal Prussia,
   - in the computer lesson - study on the interesting websites about Nicolaus Copernicus.

2. **Did you take into account historical and geographical aspects in lessons about astronomical table of Nicolaus Copernicus otherwise? How?**
   a) introductory lesson
   Prior the lesson the curriculum vitae of Astronomer preparation by students, during presenting of the history of astronomical table, the discussion about the works of T. Przypkowski and J. Sikorski and for motivation of pupils presentation of the astronomical table made by students.
   b) basic lesson
   Prior the lesson the history of calendars evolution preparation by students, presentation and discussion of the graph received by students and comparing it with the Copernicus table (conclusions).
   c) general remarks
   We can also try to introduce the **research project**, where students in teams describe and observe the apparent motion of the Sun, for example over three months (so as they observe the equinox), while during the introductory lesson they present a problem with identifying the beginning of Easter under the Julian calendar and the role of Nicolaus Copernicus in the reform work. However, to lead out mathematical formula (for 13 – 15 olds), characterizing a straight line for equinox obtained during observation of apparent movement of the Sun is not recommended. Rather, after the presentation of the results to show only astronomical table of Nicolaus Copernicus and discuss his idea of designating an equinox.

3. **How to repeat observations of Copernicus in a safe way for students**

The best could be:
   a) to mark measurements on the wall, in a place inaccessible to other students,
   b) the wide-angle camera or webcam can be used, if the points are on the ceiling, but before we need to suppose the observational errors of measurements.

4. **How to perform astronomical observations in order to reduce measurement errors?**

We would propose the use of mirror on the floor and the kind of level, if you are still going to do measurements on the ceiling.

5. **What changes in the organization of the working group elaborating "Case study" you would like to make? (eg.: size of the group, scope of work, frequency of meeting, character of work, collaboration, payment)**

6. **What should be the means of the project results dissemination? (eg.: question of instruments – didactical aids, ppt presentations, open propositions – taking into account, circumstances of school, curriculum preferences of teachers).**
   - **a)** internet,
   - **b)** cooperation with the authors of the website http://copernicus.torun.pl,
   - **c)** articles at the school websites, but also in the press,
   - **d)** presentation of student work to a wider audience.

At the final stage of the Seminar Dr J. Turło has summarize the our discussion at expressed the wish for the next possibility to collaborate within such valuable project as HIPST. Furthermore, She informed, that during the course of project the following papers have been published.

Publications:

1. *Energy – historical, interactive and pedagogical path*, G. Karwasz, A. Karbowski, J. Turło, J. Kruk, Girep 2008, Nicosia, Cyprus.
2. *Introduction of history and philosophy of science elements for curriculum development*, J. Turło, G. Karwasz, K. Służewski, A. Karbowski, K. Przegiętka, 7th IOSTE Syposium for Central and Eastern Europe Proceedings, 2009, pp. 165-171.
3. *The solar calendar of Nicolaus Copernicus, Part I*, Z.Turło, A. Witkowska, J. Turło, Nauczanie Przedmiotów Przyrodniczych, 29, 2009. pp. 9-17.
4. *Spectacles as a simple optical device, starting from the history*, J. Kosicki, Nauczanie Przedmiotów Przyrodniczych, 29, 2009. pp. 23-27.
5. E*uropejski projekt FP7 History and Philosophy in Science Teaching (HIPST)*, J. Turło, G. Karwasz, K. Służewski, A. Karbowski, K. Przegiętka, Nauczanie Przedmiotów Przyrodniczych, 30, 2009, pp. 41-48.
6. *The solar calendar of Nicolaus Copernicus, Part II*, A. Witkowska, Nauczanie Przedmiotów Przyrodniczych, 30, 2009. pp. 25-29.
7. *The solar calendar of Nicolaus Copernicus, Part III*, M. Czerwińska, Nauczanie Przedmiotów Przyrodniczych, 30, 2009. pp. 30-40.
8. *Development of concept on shape of Earth*, J. Szubiakowski, Nauczanie Przedmiotów Przyrodniczych, 31, 2009, pp. 8-12.
9. *Interactive education – exhibition on optics „From Witelo to optical tomograph"*, G. Karwasz, Nauczanie Przedmiotów Przyrodniczych, 31, 2009, pp. 20-25.
10. *Optical microscope since the first to the contemporary one – HIPST lesson proposition*, M. Sadowska, Nauczanie Przedmiotów Przyrodniczych, 31, 2009, pp. 26-36.
11. *Optics lesson with the use of Witelo studies*, J. Chojnacka, Nauczanie Przedmiotów Przyrodniczych, 32, 2009, pp. 16-22.
12. *Telescope at school lessons – to be Galileo themselves*, K. Rochowicz, Nauczanie Przedmiotów Przyrodniczych, 32, 2009, pp. 23-28.
13. *Optics lessons based on history and philosophy case studies*, J. Turło, J. Chojnacka, M. Czerwińska, J. Kosicki, K. Przegiętka, K. Rochowicz, M. Sadowska, in print.