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Unidentified Apparatus by

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We have been working with an unidentified apparatus since 2011. We decided upon an instrument - due to a project-seminar called “Physical Apparatuses – in the past and today” - which is shown in the physical school collection of the Holbein-Gymnasium Augsburg. We chose the unidentified instrument based on initial noisiness. At that time, we did not recognize which proportions it would take. Yet, we were very happy with our decision. The project was extremely interesting and we gained a lot of experience.

Figure 1. Poster which was presented on the poster session; http://www.holbein-gymnasium.de/Seminare/Ph-Geraete/Plakat_unbekannt.pdf

First of all, there was no useful information about this apparatus. Initially, particulars like the producer Johann Michael Ekling and the place of manufacture Vienna (engraved on the instrument) were our only references. Besides that, we knew that a former teacher of the Holbein-Gymnasium had worked with the apparatus. After having talked to him, we were able to set up our first speculation: It could be possible that this instrument is able to measure the earth´s magnetic field. Furthermore, he recommended us to contact Prof. Dr. Peter Heering on his opinion concerning the instrument’s function.

In a next step, we started to check up the place of manufacture. Based on the contact to Vienna´s public record office, we got some new information about Johann Michael Ekling. He was a resident mechanic and disposed of the privilege of electro-galvanic inductors. Moreover, we were told to turn to Vienna´s technical museum. Due to such hints, we saw a bit clearer.

At that stage, I sent some pictures of the instrument to Peter Donhauser (TM Vienna) – he was recommended to me by the public record office. Donhauser thought it could be an instrument of measure of the earth´s magnetic field according to Gauß and Weber. He

also added that the attachment of the magnetic needle was not correct. Later, this thesis came out to be a true one.
During the further process, I established contact to Prof. Dr. Peter Heering. I sent him some pictures, too. His first hypothesis was – insofar as you can make speculations on the basis of some images only – that it is a current measurement device. The current coils are suitable to an astatic galvanometer. In this case, there should a magnetic needle between and on the top of the current coils.
Because of the fact that our project suited very well with of content to the ICHSEE 2012, Prof. Dr. Peter Heering invited us to this event. He gave us the chance to present the project on a poster. From that time on, it was getting very interesting and exciting. There were not only two different paths of speculations, there was also the fact that we had the opportunity to introduce our project to a big and international audience. This was a real challenge.
In the poster session, I was able to establish a few contacts and talk with some experts about the apparatus. Amongst others, I talked to Paolo Brenni and asked him about his opinion relating to the instrument. Initially, he gave us advice to skim through "Dingerl´s Polytechnisches Journal" (a digital summary on the internet) for evidence. Unfortunately, the search was not successful.
Paolo Brenni supposed that our apparatus was similar to a tangent galvanometer. This goes together with the assumption of Prof. Dr. Peter Heering. Both hypotheses refer to current measurement. Based on the material used, it is very probable that the instrument was built in the second third of the 19th century.
As I talked to other participants of the ICHSEE, the opinion arose that it could be about a differential galvanometer. With the help of this assumption the four electric connections can be explained.
At the end of the day, I met Mrs. Gjudjenow from the Optical Museum Jena. She informed me about Mrs. Bong of the Humboldt-University Berlin who might be interested in apparatuses by Johann Michael Ekling. Unfortunately, her interest only was with instruments of telecommunication by Ekling.
All in all, the taking part in the ICHSEE revealed many new details and the discussions were very fruitful. Unfortunately, there was no definite clue to it all.
A few weeks later, we arranged a meeting with Mr. Rebenyi, the host of the factory of the Deutsches Museum. After having analyzed the instrument thoroughly, we asserted that the tower could not be the original one as the tower does not fit into the overall view. Due to the oxidized material, it is most likely that it is about less high quality material.
The University of Göttingen has a big collection of historical apparatuses. Therefore, Mr. Rebenyi recommended us to get in touch with Prof. Dr. Markus Münzenberg. We knew that an original breadboard by Gauß and Weber exists in Göttingen. After he had had a look at some pictures of the instrument, he wrote us an E-Mail with his assumption. According to him, it is a current measurement device, too. Mr. Dr. Gerrit Eiler (University Göttingen) answered, too. In his opinion, it is presumably a matter of a sine galvanometer. A theoretical measurement could possibly look like that:
At the beginning, the earth´s magnetic field´s intensity has to be determined with the aid of the method of Gauß and Weber. Next, the current-free instrument must be aligned in a

horizontal way. The apparatus must be rotated until the magnetic needle is on the zero mark. It is adequate, if the needle swings between two equal values (e. g. +5°/-5°). Then the average value is zero.
After that, you can check the end-position at the angle circuit and calculate the angle of revolution. With the aid of the sine of the angle and the defined earth´s magnetic field, you are able to calculate the current which flows through the current coils.
Due to the separated circuit points, the instrument gets more flexible. You can compare current flows and differences respectively.
This seminar is going to end in February. Even if an identification of the instrument has not been possible so far, we discovered lots of useful details and we are very proud of our results. We hope that further generations of our school will be as interested in physics as we are and will then spend a lot of time to identify the unidentified apparatus and maybe even find the final clue for Ekling's apparatus.