17 Mechanical Workshop

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Besides many projects carried out for research groups, both at our institute and at other institutes of the university, the examinations of the apprentices and the installation of a new turning center draw our attention in this reporting period. We further extended the service provided by the central metal and technical material store maintained by our staff [12]. Over thirty institutes and local high schools were supplied with materials and technical support. The large number of attendants at the information meeting organized by us in November 2011, shows that this service is highly appreciated. The income generated by the production of components for outside companies was used for the continuing education of the apprentices and the workshop staff and helped to finance new workshop equipment and the extension of the central store.

In December 2011 a new computer controlled turning center (see Fig. 17.1) was installed. The machine features two high power spindles with a rotation rate of up to 5500 rpm. The fully integrated y-axis and the turret driving up to sixteen tools, either in radial or axial direction, in combination with an automatic bar loading magazine enables the automated series production of complex parts. SolidWorks 3D design software more and more used by our research groups noticeably improved the accuracy and reliability of the technical drawings.

During four weeks we conducted the basic workshop courses for bachelor students. There were six courses, each with a 35 hours work load. We also directly supported a number of bachelor- and master-theses. In October 2011 we organized two welding courses for physics laboratory assistant apprentices from the ETH. For those interested in a grade as polytechnician we again provided two one-week trial apprenticeships.

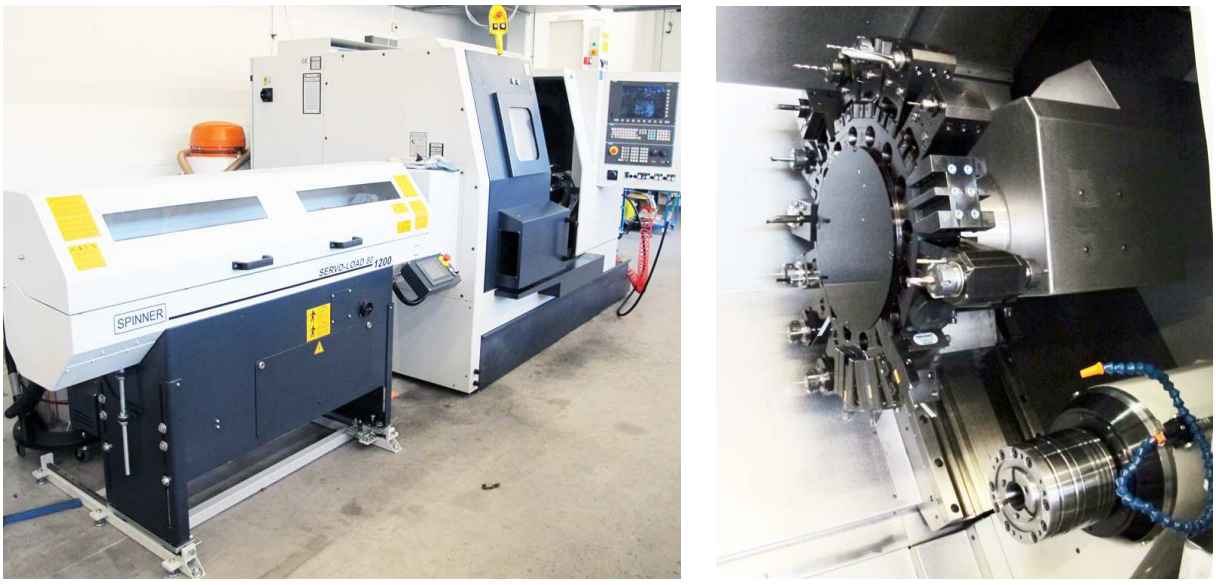


FIG. 17.1 – *Left: new twin turret-turning center with bar loading system. Right: the turret for up to 16 tools and the right spindle.*

[12] For a catalogue see http://www.physik.uzh.ch/groups/werkstatt/

FIG. 17.2 – *CTA FlashCam prototype structures.*

FIG. 17.3 – *Borazon cooler device.*

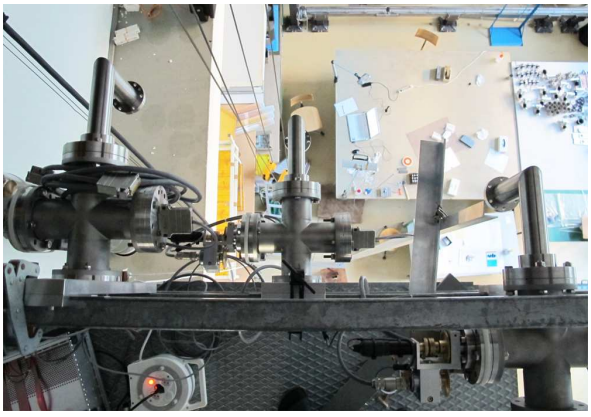


FIG. 17.4 – *The GERDA calibration system being tested in the assembly hall.*

Below we mention a selection of our activities:

- **CTA Cherenkov Telescope Array (Sec. 6)**
  Several test setups were manufactured. We produced a prototype structure for the CTA FlashCam project and modified parts for the Active Mirror Control (AMC) actuators (Fig. 17.2).

- **Surface Physics (Sec. 14)**
  We manufactured a custom-built borazon cooler device (Fig. 17.3). Different series of components made out of molybdenum and stainless steel were fabricated.

- **Neutrinoless double betadecay (Sec. 3)**
  For the GERDA experiment we designed and manufactured the mechanics of the calibration system. The three complete systems were thoroughly tested in the assembly hall of the workshop (Fig. 17.4) before transportation to the Gran Sasso Underground Laboratory (LNGS). In autumn 2011 we started with the assembly of a freon liquefaction plant.

- **Superconductivity and Magnetism (Sec. 12)**
  A very ambitious task was the design and construction of a rotating sample holder with special coils (Fig. 17.5). The device runs inside a low temperature cryostat and the orientation of the probe is computer controlled with very high precision. The requirements for all parts including the gear wheels were very strict. We again produced evaporation masks and high-pressure containers made out of high-tensile materials.

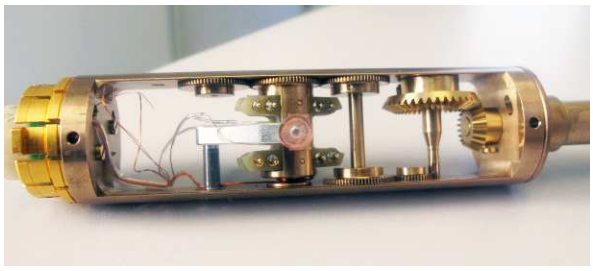
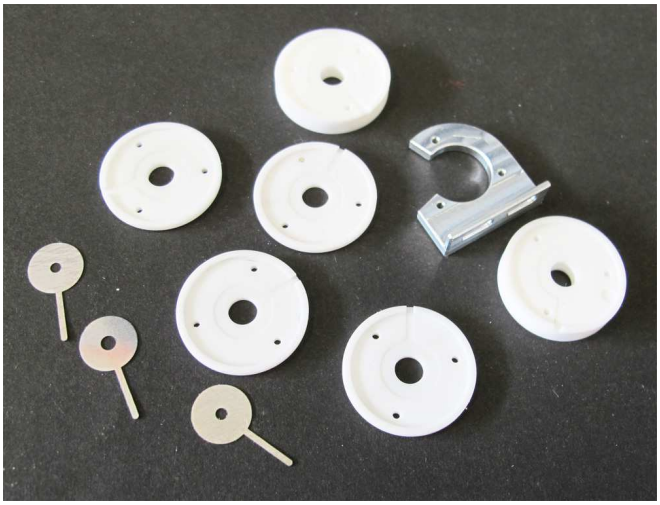


FIG. 17.5 – *Probe holder with the precision gear for the sample rotation and the special coil.*



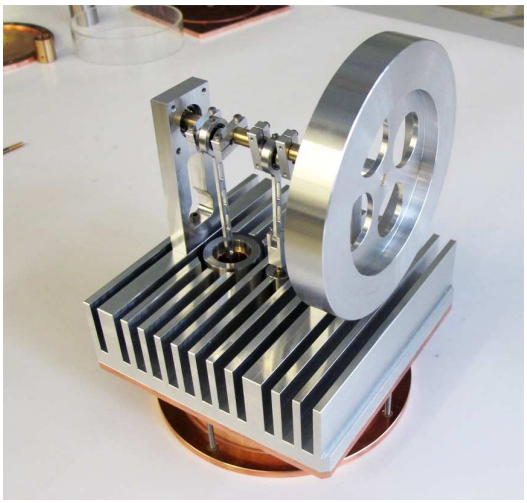


FIG. 17.6 – *Left: special working parts made for the low energy electron point source (LEEPS). Right: gamma-type Stirling engine made by an apprentice in his final examination.*

- **Physics on the nanometer scale (Sec. 15)**
  The special vapour deposition device with six coating stations had to be modified and the water cooling system was improved. We manufactured tiny custom-built high voltage connectors using ceramic and plastic materials which have to work under vacuum. All necessary parts for a low energy electron point source were manufactured (Fig. 17.6 left).

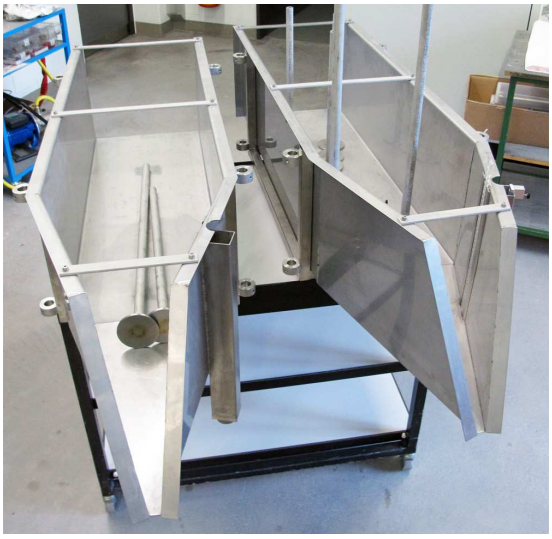
- **Continuing education of the workshop staff**
  The workshop staff attended CAD software courses introducing the Catia Tools *Kinematics* and *3DVIA Composer* and the basics of *SolidWorks*. We took welding training courses and went to seminars on new tooling and state of the art machinery techniques and in relation with the education of the apprentices to the regular meetings. Tutorials in programming and operating of the new turning center were organized.

- **Education of the apprentices**
  The final and intermediate examinations of the apprentices in May and June 2011 were carried out with great success. In his final work the candidate manufactured all the parts for a Stirling engine (Fig. 17.6 right). In August 2011 a new apprentice started his education. Besides the mandatory Swissmechanic courses the apprentices attended again advanced courses in computer controlled machine (CNC) programming, pneumatics and electronics.

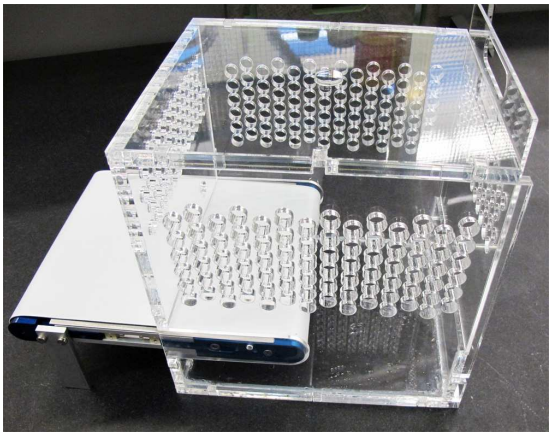
In this reporting period the demand from other institutes of the university on our laser cutting system has grown notably. This modern machine could be fully exploited:

- **Museum of zoology**
  A series of 250 custom-built headphones.

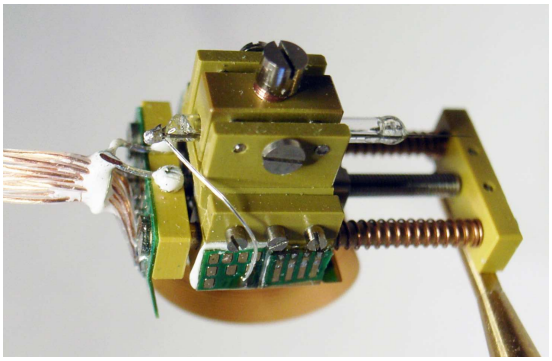
- **Department of geography**
  Two special metallic channels for measuring the volumetric flow rate of melt water.



- **Institute of neuroinformatics**
  A special plastic box with an integrated conveyor band used to study the behavior of oscine

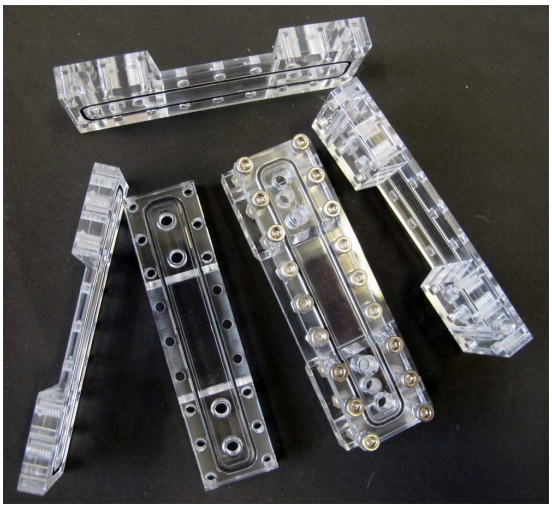


birds and a miniaturized piezodrive with sensor holder. Note that the diameter of the screws is only 0.8 mm!



- **Institute of virology**
  Small series of parts which are Javel water resistant

- **Institute of physiology**
  Dedicated membrane holders made out of plexiglass.



- **Outside company**
  A high performance LED lamp