

## Minutes of the CHAPS meeting held in Bern on Friday October 5, 2012

### College of Helvetic Astronomy ProfessorS (CHAPS)

#### 1) Call to Order

The chair, G. Meylan, calls the meeting to order at 10:00 am.

He welcomes M. Pohl (UniGE) as a CHIPP observer and M. Steinacher (SER) as a permanent member from SER.

Attendance at the meeting :

Present : W. Benz (UniBE), M. Carollo (ETHZ), Th. Courvoisier (UniGE), A. Jäggi (UniBE), P. Jetzer (UniZH), J.-P. Kneib (EPFL), G. Lake (UniZH), G. Meylan (EPFL, chair), G. Meynet (UniGE), B. Moore (UniZH), F. Pepe (UniGE), D. Pfenniger (UniGE), M. Pohl (UniGE, CHIPP), A. Refregier (ETHZ), D. Schaerer (UniGE), W. Schmutz (PMOD/WRC), M. Steinacher (observer from SER), N. Thomas (UniBE), S. Udry (UniGE), R. von Steiger (UniBE),

Excused : S. Antusch (UniBas), L. Baudis (UniZH), C. Charbonnel (UniGE), R. Durrer (UniGE), S. Lilly (ETHZ), M. Meyer (ETHZ), D. Queloz (UniGE), U. Seljak (UniZH), M. Shaposhnikov (EPFL), F.-K. Thielemann (UniBas), P. Wurtz (UniBE).

#### 2) Prioritization of the future instrumental programs in astronomy

##### 2.1) Introduction

There are now nearly six years that the « Roadmap for Astronomy in Switzerland 2007–2016 » has been published. The chair call to mind the first and essential point of the agenda of the present meeting : (i) the need for a discussion among astronomers in Switzerland in order to evaluate what has changed on the scene of astronomy since the roadmap publication, and (ii) the need for a prioritization of the coming important new instrumental projects related to ground-based astronomy.

The chair reminds that the Swiss participation in ESO and ESA is fundamental for all astronomers in Switzerland. There is complementarity between ground-based and space-born observations. Consequently, any discussion should be and will be done in full coordination between the Swiss Commission for Space Research (CSR, chair W. Schmutz) and the Swiss

Commission for Astronomy (SCFA, chair G. Meylan).

In addition to the support for a Swiss participation to ESO and ESA, the Roadmap emphasized also the full support of the astronomers in Switzerland for the E-ELT and ALMA projects, as well for increased contributions of the SER to ESO FINES/FLARE, ESA PRODEX, ERANET, and increased support from the SNSF, e.g., in order to foster the development of a Swiss community made of ALMA users.

### **2.1) NOEMA, an IRAM extension**

The chair reminds that Karl Schuster, vice-director of IRAM, has contacted him to talk about the NOEMA project, namely an extension of IRAM from 6 to 12 antennas, each with a diameter of 15 meters. At the moment, 4 of the new 6 antennas are funded, and IRAM is looking for partners interested in contributing significantly to the funding of the remaining two antennas. The cost of one antenna is about 5 MEuros. This gives immediately an indication that any participation in the project would be of the order 1 MEuros or more. Any investment would correspond to some guaranteed observing time. See the following website for more information related to NOEMA : <http://www.iram-institute.org/EN/content-page-235-3-235-0-0-0.html>.

The Swiss astronomical community should therefore determine if there is a strong scientific interest in Switzerland, strong enough to justify a significant participation of Switzerland in NOEMA. Is NOEMA, with its specific capabilities for surveys, a useful complement in the Northern hemisphere of ALMA in the South ?

Then, the chair gives everybody attending the meeting the opportunity to briefly state what are the most important projects in their institutes, for which they would look for a general support from our community in order to benefit from funds from the SER. Below are listed the requested brief summaries of these presentations which have reached the chair before the writing of these minutes.

### **2.2) ETHZ by M. Carollo and A. Refregier**

ETH-Zurich is in the final stages of joining the Dark Energy Survey (DES) Collaboration. This project, which had its first light in September 2012, will provide a 5000 square degree imaging survey in 5 optical bands. This is to be done with a new 2.2 square degree camera (DECAM) mounted on the 4m Blanco telescope at CTIO in Chile. DES will combine measurements of weak lensing, Baryon Acoustic Oscillations, Galaxy clusters, and Supernovae to provide constraints on the properties of Dark Energy and on other sectors of the concordance cosmological models, as well a wealth of information for other fields of astrophysics such as galaxy evolution. The scientists involved at ETH-Zurich are Dr. Adam Amara, Prof. Marcella Carollo, Prof. Simon Lilly and Prof. Alexandre Refregier. Some of these scientists are also exploring membership in future wide field surveys such as DESpec (a spectroscopic counterpart to DES), MOONS and LSST.

### **2.3) EPFL by J.-P. Kneib and G. Meylan**

In collaboration with UniGE and UniZH, EPFL is strongly involved in the EUCLID space mission, selected by ESA in October 2011. EUCLID goal is to probe Dark Energy and the cosmological world model by conducting a high accuracy imaging survey of the extragalactic

sky in both imaging and spectroscopy of about 1.5 billion galaxies. Because of the high resolution imaging of Euclid, gravitational lensing survey can be conducted to map the Dark Matter distribution on the sky. With the parallel grism spectroscopy observations, EUCLID will also measure the redshifts of tens of millions of galaxies, allowing the determination, at the percent level, of the Baryonic Accoustic Oscillation (BAO) between  $1 < z < 2$ .

Before the launch of EUCLID in 2021, EPFL is involved in the cosmological project called “extended Baryonic Oscillations Spectroscopic Survey” (eBOSS) (PI: Jean-Paul Kneib), which will be implemented over the 2014-2018 period. The eBOSS goal is to target  $\sim 3/4$  million emission-line galaxies ( $0.6 < z < 1.2$ ) and  $\sim 1/2$  million quasars ( $1 < z < 2$ ) over 3,000 square degrees, to probe the large scale-structures and measure for the first time the BAO peak in the uncharted  $0.6 < z < 2$  region of the Universe. eBOSS is one of the 3 projects that will run on the Sloan 2.5m telescope. The date of the first Sloan-IV observations is planned for September 2014. In October 2012, the Sloan foundation has accepted to sponsor the Sloan-IV project by giving 10 million US\$.

As a second step, EPFL aims to participate in the building a new dedicated experiment, BigBOSS, that will map the galaxy 3D distribution over the largest possible sky area ( $\sim 14,000$  square degree) increasing by at least an order of magnitude the number of known galaxy spectra known (gathering  $\sim 20$  to 30 million redshift). To achieve this, EPFL works on a design of a 5000-fiber robot that will address each of the targeted galaxies and feed 10 spectrographs, each of them comprising 3 different channels. The BigBOSS project started in 2009 (PI: David Schlegel). In September 2012, the National Optical Astronomy Observatory (NOAO) has agreed to dedicate the Kitt Peak Mayall 4m telescope to run a large-scale experiment such as BigBOSS, and the Department of Energy as decided to fund a massive spectroscopy Dark Energy experiment. Recently, the Moore foundation has accepted to sponsor the BigBOSS project by giving 2.1 million US\$ allowing to initiate the funding process of the BigBOSS project.

#### **2.4) UniZH by B. Moore**

No report received. B. Moore and G. Lake called to mind their project of a Swiss Astrophysical Theory Center.

#### **2.5) UniGE by Th. Courvoisier**

No report received. Th. Courvoisier mentioned the CTA and LOFT projects.

#### **2.6) UniBE – PIUB by W. Benz**

No report received. W. Benz mentioned the recently accepted ESA satellite CHEOPS.

#### **2.8) UniGE by F. Pepe**

No report received. F. Pepe mentioned the HIRES instrument project for the E-ELT.

#### **2.9) PMOD/WRC by W. Schmutz**

Short report on Solar Physics in Switzerland. The landscape of Solar Physics in Switzerland changed considerably since the time when the Swiss roadmap has been written. The most

important change is that Solar Orbiter has been selected as the first medium size mission of ESA's Cosmic Vision. The launch will be 2017 and the main science goals will be addressed after about three years in orbit, i.e. about 2020, when the space craft will get to a perihelion of about 1/5 of an AU and gradually higher and higher ecliptic latitudes will be reached. Switzerland is deeply involved in hardware contribution for Solar Orbiter. The University of Applied Sciences and Arts Northwestern Switzerland (FHNW) is the PI institute of STIX, an experiment observing the Sun in X-rays, and PMOD/WRC in Davos builds major contributions for the Extreme Ultraviolet Imager (EUI), and the coronal spectrograph (SPICE). According to their hardware contributions the two institutes are enlarging their science staff focusing on the science goals of the experiments. The Solar Physics department at ETH Zürich does not anymore exist but fortunately, this loss is compensated by the FHNW, which entered new as institute with a Solar Physics research group. Still remaining engaged in Solar Physics is IRSOL focusing on science based on their observing facility using their polarimetric ZIMPOL detectors. With ESA's Solar Orbiter launch in a few years, the future of Solar Physics in Switzerland looks bright.

### **2.10) UniGE by D. Schaerer**

No report received. D. Schaerer expressed some interest in the NOEMA project.

### **2.11) UniBE - AIUB by A. Jäggi**

No report received. A. Jäggi mentioned the Galileo and GRACE projects, presented in the roadmap and related to fundamental physics (gravity).

### **2.12) UniGE – CHIPP by M. Pohl**

Activities of the Center for Astroparticle Physics (CAP) Genève are somewhat on the fringes of what is of interest to CHAPS. The main activities are :

- The Alpha Magnetic Spectrometer AMS-02, installed on board of the ISS in May 2011 and taking data successfully since. The total statistics of cosmic rays in the GeV to TeV energy range is approaching 20 billion events. The commissioning phase has been concluded, the analysis of the first year of data is progressing rapidly.
- The filter wheel construction for the Astro-H x-ray mission of JAXA is in its final phase.
- The POLAR Compton polarimeter for hard x-rays from GRB's is in phase C/D, in collaboration with institutes from the Chinese Academy of Sciences (CAS). A qualification model will be delivered to China in November, a second one will be tested in Europe. The flight model will be delivered by the end of 2013, for a flight on Tiangong 2 in 2014.
- The CAS has invited us to contribute to two further projects, the DARK MATTER PARTICLE EXPLORER DAMPE and the HIGH ENERGY RADIATION DETECTOR HERD. DAMPE is a technology-oriented mission, with a Si-W tracking calorimeter and a BGO calorimeter of unprecedented depth. We contribute the Si-W subsystem for cosmic ray tracking and identification as well as high-energy photon conversion à la FERMI/LAT. A calibration model, about 1/4 of the final size, will be constructed in 2013, a flight model in 2014, pending SSO/Prodex approval. HERD is a more ambitious and long term project along the same lines: combining cosmic ray and high energy photon sensitivity aiming at information about the origin of cosmic rays and dark matter.

In addition, I informed CHAPS about the ambitious UniGe plans to create a new center for the physical sciences, including Mathematics, Astronomy and Physics. The new center will

have a national and international component aiming to reach beyond the UniGe boundaries. It would thus be an interesting candidate to host the Swiss Astrophysical Theory Center presented at the meeting.

### **2.13) UniBE – PIUB by N. Thomas**

Two forthcoming Planetary Sciences missions :

#### ExoMars Trace Gas Orbiter

The ExoMars Programme will demonstrate key flight and in situ enabling technologies in support of the European ambitions for future exploration missions, as outlined in the Aurora Declaration and will pursue fundamental scientific investigations.

The ExoMars scientific objectives are:

- To search for signs of past and present life on Mars ;
- To investigate the water/geochemical environment as a function of depth in the shallow subsurface ;
- To investigate Martian atmospheric trace gases and their sources.

Two missions are foreseen within the ExoMars programme for the 2016 and 2018 launch opportunities to Mars. The 2016 mission is an ESA-led mission that will be launched by a Roscosmos supplied Proton rocket. ESA will supply a Mars orbiter (the Trace Gas Orbiter or “TGO”) that will carry a 600 kg Entry, Descent and Landing Demonstrator also supplied by ESA. Scientific instruments will be accommodated on TGO to support the search and localisation of methane and trace gas sources on Mars.

The intention of UBE is to develop an imaging system which complements the imaging acquired previously at Mars. We formulate the primary objectives of CaSSIS (Colour and Stereo Surface Imaging System) as follows :

- To characterize sites which have been identified as potential sources of trace gases ;
- To investigate dynamic surface processes (e.g. sublimation, erosional processes, volcanism) which may contribute to the atmospheric gas inventory ;
- To certify potential future landing sites by characterizing local slopes, rocks, and other potential hazards.

CaSSIS will observe a swath (>8 km wide) in colour thereby providing the best colour imaging acquired from Mars, so far. It will have excellent stray light rejection and essentially identical photometric angles and path lengths through the Martian atmosphere for each colour band. The 5 m/pixel colour imaging will improve mapping and interpretation of mineral units identified by spectrometers. The stereo capability will be achieved using an all-Swiss approach to the design of a rotation drive which will rotate the optics through 180° to acquire 2 images with 20° convergence on one pass. The resulting Digital Terrain Models (DTMs) will enable stratigraphic measurements and identification of surface roughness for landing site certification.

The instrument development will be a joint collaboration between Switzerland and Italy.

#### JUICE

As is now well known, JUICE was selected as ESA's L1 mission. Uni Bern is participating in 5 experiment proposals. The main development will be for part of a particles package, PEP, in collaboration with the Institute for Space Physics in Kiruna, Sweden. Uni Bern will develop the neutral mass spectrometer. Minor participations based on previous heritage are foreseen in a camera proposal (JIMI), a laser altimeter proposal (GALA) and a dust mass spec. (DOTS). Scientific participation is also foreseen in a UV spectrometer proposal (as complement to PEP). In view of the intense competition, it is not expected that all proposals will be successful. Notification is expected before January 2013.

#### **2.14) UniBE – ISSI by R. von Steiger**

No report received. Mentioned for ISSI the coming change of executive director and the renewal of funding resources.

#### **2.15) UniZH by P. Jetzer**

Although LISA has not been selected as the L1 mission, work is still actively going on. The LISA Pathfinder mission is scheduled to be launched end of 2014 or beginning 2015. The main problems which came up in the last years have been largely solved and the foreseen rocket Vega has been successfully tested in February. Work on LISA is also going on in Switzerland, where we are working on improving the front-end electronics to meet the required LISA specifications. Theoretical work on gravitational waves is actively pursued within my group at Zurich University. Collaboration with ISDC has already been discussed and shall start as soon as possible (contact point: Stephane Paltani). Switzerland is actively involved in the ESA M3 candidate mission STE-QUEST, whose aim is to get better tests on general relativity. Experimental work especially on atomic clocks needed for the mission is performed by a consortium lead by CSEM in Neuchatel (+ Uni Neuchatel and Bern). I am a member of the science team of STE-QUEST and starting some theoretical activity on related topics.

#### **2.16) SER by M. Steinacher**

As already mentioned to the chair before this before this meeting, SER would appreciate to receive, within about a year, a small report describing the already existing projects along with the new ones, as selected-prioritized by the Swiss astronomical community.

### **3) Composition of the SCFA and CHAPS (as suggested by M. Carollo)**

M. Carollo mentioned the fact that there are still too few women in astrophysics in Switzerland. Everybody agrees : although there are now a few female professors, it is agreed that efforts have to be maintained and even increased.

She also asked what are the rules for the composition of the CHAPS and the SCFA. The chair calls to mind the present rules :

- The CHAPS members are all the professors, which have been hired by a Swiss university, generally, through a selective and competitive way. The responsibility to announce new CHAPS members is left to the responsibility of each institution.

- The SCFA is made of all the directors of each astronomy related institute-laboratory in Switzerland. In addition, the SCFA has also one MAP delegate, one IAU delegate, and one observer from SER among its members. The presence of all directors, initiated at the beginning of the term of the current chair, gives more decision power and more weight to all decisions made by the SCFA. De facto, the SCFA is the “executive bureau” of the CHAPS.

#### **4) Preparation of an addendum to the current roadmap**

As already planed before this meeting and as emphasized by M. Steinacher (see above), the SCFA and CHAPS are going to work jointly, during the coming year, at the prioritization of the new projects and then at the writing of a small report describing the plans of the Swiss astronomical community.

#### **5) Miscellaneous**

None.

#### **6) The meeting is adjourned at 12:30 pm.**