Bericht der 82. Jahresversammlung der SASEG vom 20. bis 22. Juni 2015 in Baden

Bericht der 82. Jahresversammlung der SASEG vom 20. bis 22. Juni 2015 in Baden

Heinz M. Bürgisser[1]

Teilnehmer (95): Abednego, Martinus (StN); Aliyev, Fuad (StN); Bachmann, Bettina; Bachmann, Martin; Baumgartner, Walter; Bichsel, Matthias; Bossart, Paul (E); Boulicault, Lise; Brink, Heinz-J.; Brumbaugh, William & Michele; Burckhardt, Jenny; Bürgisser, Heinz & Trudy; Burri, Peter; Cartier, Edi & Verena; Dielforder, Armin (StN); Eckert, Ruedi; Eichenberger, Urs; Fankhauser, Kerstin (St); Fleckenstein, Martin & Margit; Fraenkl, Res & Katrin; Franks, Sibylle; Gautschi, Andreas (R); Glaus, Martin & Ellen; Gorin, Georges; Graf, René & Helena; Grasmück, Kurt & Madlen; Gregorczyk, Lukasz; Grossen, Viktor & Friederike; Gruber, Marius (StN); Gunzenhauser, Bernhard & Censier, Kathrin; Häring, Markus; Hartmann, Daniel & Hartmann-Timmer, Anita; Hauck, Michael; Häusler, Mauro (St); Heckendorn, Werner (E); Heitzmann, Peter; Heuberger, Stefan; Jordi, Res & Susanna; Kaufmann, Manuela (St); Keller, Franz; Knup, Peter & Heidi; Kuhn, Peter; Lohmann, Hinrich; Lutz, Manfred & Kathrin; Madritsch, Herfried (E, R); Massaras, Dimitri & Schurtenberger, Heidi; Matter, Albert; Meier-Senn, Beat (E, R); Meylan, Benjamin; Mohler, Hanspeter & Dorothea; Müller-Merz, Edith & Hansjakob Müller; Oehms, Eckhard; Reichetseder, Peter & Iris; Reinhard, Benedict; Rothermund, Heinz & Bunzi; Scherer, Frank; Schiettecatte, Jean & Nicole; Schmid, Stefan & Jacobs, Inge; Schmidt, Thomas; Schnellmann, Michael (E, R); Schwendener, Brigitte; Seemann, Ulrich; Shafizadeh, Amir (StN); Sommaruga, Anna; Stumm, Fred; Suana, Michael; Teumer, Peter & Renate; Uttinger, Jörg; Vouillamoz, Naomi (StN); Wabbels, Dorothea; Wyss, Roland; Ziegler, Christine (N); Ziegler, Martin.
[E] Exkursionsleiter 21. bzw. 22.6; [R] Referent 20.6.; [St] Studentenmitglied; [StN] Neues Studentenmitglied; [N] Nichtmitglied (Gast)

Samstag 20. Juni: Administrative und wissenschaftliche Sitzungen (Hotel Du Parc), Partnerausflug, Apéro und Nachtessen (Hotel Du Parc)

I Generalversammlung

(Protokollentwurf, zu genehmigen am 25. Juni 2016 an der GV in Heidelberg)

Um 13:50 Uhr begrüsst Präsident Peter Burri die anwesenden Mitglieder in einem Konferenzsaal des Hotels. Er erklärt auf Englisch, dass traditionsgetreu die Geschäfte der Vereinigung auf deutsch durchgenommen würden und entschuldigt sich dafür bei den (wenigen) anwesenden Mitgliedern ohne ausreichende Deutschkenntnisse.

[1] Vorstandsmitglied SASEG

1 Genehmigung des Protokolls der GV vom 21. Juni 2014 in Aosta

Der Protokollentwurf der letztjährigen Generalversammlung, publiziert im Swiss Bulletin für angewandte Geologie (19/2, 2014, 157-167) wird diskussionslos genehmigt.

2 Bericht des Präsidenten, Juni 2014 – Juni 2015

P. Burri begann mit der erfreulichen Mitteilung, dass in den letzten 12 Monaten die Mitgliederzahl nochmals um 3 Mitglieder anstieg, auf 330.

Mitgliederzahl am 21. Juni 2014	327
Eintritte (persönliche Mitglieder, davon 9 als Studentenmitglieder)	+ 19
Eintritte (Firmenmitglieder)	+ 1
Austritte	- 7
Ausschlüsse	- 7
Todesfälle	- 3
Mitgliederzahl am 20. Juni 2015	330

Danach verliest P. Burri die Namen der 19 innerhalb der letzten 12 Monate zugetretenen persönlichen Mitglieder, wobei sich die anwesenden Neumitglieder kurz erheben. Der Präsident erläutert die von der Vereinigung angebotene finanzielle Unterstützung für neue und bisherige Studentenmitglieder und dankt für alle diesbezüglichen Beiträge von Mitgliedern, wodurch an jeder Jahrestagung 10-15 Studenten gesponsort werden können.
Acht Mitglieder werden für ihre langjährige Mitgliedschaft geehrt. 50 Jahre dabei sind Michel Gisiger, Hanspeter Mohler und Hanspeter Luterbacher, 60 Jahre dabei Philippe Biro, Christoph J. Kerez, Jean-Pierre de Loriol und Hans Widmer. Res Jordi ist sogar 65 Jahre lang Mitglied. Der anwesende Hanspeter Mohler nimmt seine vom Präsidenten unterzeichnete Urkunde persönlich entgegen; Res Jordi wird sie während des heutigen Apéros erhalten (siehe unten). Den anderen Jubilaren wird die Urkunde samt einem persönlichen Begleitschreiben zugeschickt.
Dann wird stehend und schweigend den drei Mitgliedern gedacht, die in der Berichtsperiode verstarben:
- Edouard Lanterno (Mitglied seit 1949, Ehrenmitglied seit 2004)
- Nazario Pavoni (Mitglied seit 1957)
- Heinrich Schwendener (Mitglied seit 2009)

P. Burri's Rückblick auf die Vereinstätigkeit beginnt mit den starken Veränderungen in den letzten Jahren: 50% der heutigen Mitglieder sind in den letzten 10 Jahren eingetreten; die Vereinigung wird viel mehr bei Behörden wahrgenommen; sowie der Namenswechsel. Letztes Jahr waren wir Mit-Organisator des Symposiums über Fracking auf dem Gurten, wobei wir die Referenten seitens der Industrie einbrachten. Das Thema-Bulletin über Fracking war ein Erfolg; 250 zusätzliche Exemplare wurden gedruckt, vor allem für die Teilnehmer der Gurten-Tagung. Ein derartiges thematisches Heft gibt Mehrarbeit vor allem für den Redaktor und die Redaktionskommission, aber es lohnt sich.
P. Burri berichtet weiter von seiner Mitarbeit in Expertengruppen bei acatech (Deutsche Akademie der Technikwissenschaften) und EASAC (European Academies Science Advisory Council, der die EU-Regierungen berät), wobei er im Namen der SASEG auftrat. Beide Schlussberichte, über Hydraulic Fracturing bzw. Schiefergasförderung, sind nun publiziert, und die Mitarbeit von SASEG ist in den Berichten ausdrücklich erwähnt. Im Inland gaben er und U. Seemann ein gutes Dutzend Vorträge für verschiedenste Zuhörerschaften.
P. Burri schliesst mit der Feststellung ab, dass wir als Wissenschafter in der Energiediskussion, die oft unsachlich und emotional geführt wird, wieder eine Stimme erhalten müssen, und dass die Vereinigung in den letzten Jahren dazu erfolgreich beigetragen hat.

3 Bericht des Kassiers

Zu Beginn ergreift P. Burri das Wort und sagt, dass der per heute zurücktretende Werner Heckendorn zehn Jahre lang das Amt des Kassiers prima geführt hat. In dieser Periode sind die Ausgaben gewachsen, aber das Vermögen ist vergleichbar mit dem vor 10 Jahren.
W. Heckendorn zeigt darauf den Abschluss 2014 (Fig. 2/1) und erläutert die Gewinn- und Verlustrechnung (Tab. 1).

Vermögen per 31.12.2013	99'071.61
Verlust 2014	3'855.87
Vermögen per 01.01.2015	95'215.74

Der neben dem Bulletin grösste Ausgabenposten ist die SASEG-Website (das zweifache von 2013), bei der eine Neuprogrammierung anstand, die wohl etwas kostete, aber unter Leitung von Kathrin Censier effizient ausgeführt wurde; dies wird mit Applaus verdankt.

Swiss Association of Energy Geoscientists
Schweizerische Vereinigung von Energie-Geowissenschaftern
Association suisse des géoscientifiques de l'énergie
Associazione svizzera geoscienzati dell'energia

Bilanz per 31. Dezember 2014

Aktiven	1000	Kasse	324.95	
	1010	Postscheckkonto	10'025.10	
	1022	ZKB Firmenkonto	91'817.62	
	1025	ZKB Depotkonto	0.00	
	1030	Eurokonto CHF (BRD)	0.00	
	1035	Verrechnungssteuer	211.07	
Passiven	2000	Vorausbezahlte Beiträge		500.00
	2010	Trans. Passiven		0.00
	2020	Kreditoren		400.00
	2030	Vorausz. Jahrestagung 2013		-309.00
	2040	Sponsoring Studenten		6'572.00
	2300	Vermögen		99'071.61
		Verlust 2014		-3'855.87
		Total	102'378.74	102'378.74

Gewinn- und Verlustrechnung

Aufwand	3000	Bulletin	15'620.15	
	3010	Büromaterial	751.20	
	3020	Porti & Spesen	3'114.66	
	3030	Webseite SASEG	4'921.20	
	3040	Vorträge Spesen	875.55	
	3050	Steuern 2012	399.90	
Ertrag	6000	Mitgliederbeiträge		22'272.75
	6040	Jahrestagung Aosta		16.76
	6110	Wertberichtigung EURO		-43.02
	6200	Zinsen		620.50
	6300	Spenden		212.70
	6500	Buchverkauf Swiss Gang		-1'252.90
		Verlust 2014		3'855.87
		Total	25'682.66	25'682.66

Vermögen per 31. Dezember 2013	99'071.61
Verlust 2014	3'855.87
Vermögen per 1. Januar 2015	95'215.74

Tab. 1: Bilanz SASEG per 31. Dezember 2014; Gewinn- und Verlustrechnung.

P. Burri lobt W. Heckendorn bezüglich Finanzplanung der Jahrestagung Aosta, die praktisch neutral abschloss (Überschuss von Fr. 17). Zum Schluss zeigt W. Heckendorn eine Übersicht des Studenten-Sponsorings durch die Vereinigung von 2006 bis 2015. Mit Applaus wird W. Heckendorn's Arbeit verdankt, worauf der Kassier den Mitgliedern für die Zahlungsdisziplin dankte.

4 Bericht des Redaktors

P. Burri lobt den abwesenden Bulletin-Redaktor D. Bollinger für seinen hervorragenden Job in den letzten Jahren. Der Höhepunkt der letzten 12 Monate war das Erscheinen des 172-seitigen Themaheftes «Hydraulic Fracturing».
Die Artikel im nächsten Bulletin, 20/1, werden kurz vorgestellt. Heft 21/1 wird ebenfalls ein thematisches Heft, über die Möglichkeiten und Grenzen von Computersimulationen in der angewandten Geologie.
Im weiteren informiert P. Burri, dass der Vorstand an der Sitzung am Morgen beschlossen habe, dass die Bulletins ein Jahr nach Erscheinen auf der Bulletin-Website aufgeschaltet und dass die Autoren kurz nach Erscheinen ein PDF ihrer Artikel erhalten werden.

5 Bericht der Revisoren

F. Stumm liest den von Revisorin D. Decrouez am 21. Februar 2015 und von Revisor W. Frei am 26. Februar 2015 unterzeichneten Bericht vor, der beantragt, dem Kassier Décharge zu erteilen. Mit Handmehr ohne Gegenstimme wird die Décharge erteilt und damit die Rechnung 2014 genehmigt sowie Kassier W. Heckendorn entlastet.

6 Décharge des Vorstandes

F. Stumm beantragt Décharge des Gesamtvorstandes. Die anwesenden Mitglieder erteilen diese durch Handmehr ohne Gegenstimme und sprechen damit dem Vorstand ihr Vertrauen aus.

7 Wiederwahlen und Neuwahlen Vorstand

Die Wahlen werden in drei Schritten durchgeführt:

1. Zuerst werden René Graf und Roland Wyss als neue Vorstandsmitglieder vorgeschlagen. Ihr CV ist zu Beginn der GV verteilt worden; P. Burri erwähnt einige Stationen der beiden Kandidaten und vermeldet auch, dass Roland Wyss bereits von 1994 bis 2003 im Vorstand der damaligen VSP war, als Bulletin-Redaktor. Des Weiteren teilt er mit, dass René Graf vom zurücktretenden Werner Heckendorn das Amt des Kassiers übernehmen wird. Ohne weitere Wortmeldung von GV-Teilnehmern werden die beiden einzeln mit Handmehr ohne Gegenstimme gewählt, mit anschliessendem Applaus.

2. Die bisherigen Vorstandsmitglieder (ohne den zurücktretenden Werner Heckendorn) stellen sich zur Wiederwahl für zwei weitere Jahre: Daniel Bollinger, Heinz Bürgisser, Georges Gorin, Bernhard Gunzenhauser, Peter Heitzmann, Stefan Schmid, Brigitte Schwendener, Ueli Seemann und Michael Suana. Die Wiederwahl erfolgt global, mit Handmehr ohne Gegenstimme.

3. Vize-Präsident B. Gunzenhauser leitet danach die Wiederwahl von Peter Burri als Präsidenten. Er wird ohne Gegenstimme wiedergewählt.

8 Tagung 2016 Heidelberg

Vize-Präsident B. Gunzenhauser präsentiert die beiden geplanten Exkursionen, am Sonntag zur Grube Messel, zu weiteren Tertiäraufschlüssen des Kohlenwasserstoff-Systems des nördlichen Oberrheingrabens und zu einer Erdöl-Produktionsstätte, alle nördlich von Heidelberg, und am Montag zur Prä-Rift-Abfolge in der Umgebung von Freiburg.

9 Tagung 2017

Heute morgen wurde darüber an der Vorstandssitzung diskutiert, aber noch kein Beschluss gefasst. Drei Tagungsthemen liegen im Rennen: (1) Passive Margin / Öffnung der Tethys im Südtessin (möglicher Tagungsort: Como), (2) Insubrische Linie um Locarno (Locarno) und (3) Geologie, Naturgefahren und Quellen der Bündnerschiefer in Nordbünden (Flims).

10 Varia

Walter Baumgartner, Mitglied seit vier Jahren, fühlt sich als Mitglied zu passiv und möchte gerne Arbeitsgruppen, in denen auch Mitglieder, nicht nur der Vorstand, mitwirken. P. Burri repliziert, dass dieser Vorschlag offene Türen einrenne und verspricht, diesen Vorschlag auf die Traktandenliste der nächsten Vorstandssitzung zu setzen.
Daraufhin wird die Generalversammlung um 14.45 Uhr geschlossen.

II Scientific Presentations

These followed the General Assembly straight away and were conducted in English. All four talks, as well as the excursions on the following two days, centred on the geological aspects of the envisaged disposal of radioactive waste in the Middle Jurassic Opalinus Clay Formation in selected areas of north-eastern Switzerland. The merits of nuclear energy as such were not a theme of the Convention.

- Dr. Andreas Gautschi (NAGRA[i], Division Head Geology, Safety): *Deep geological disposal of radioactive waste - An international perspective.*
  The talk reviewed selected examples of worldwide solutions of disposal of radioactive waste, focussing on multibarrier systems (engineered and geological barriers). The different availability of suitable host rocks led to different choices by several leading countries of disposal studies. He emphasized that international collaboration is important and has been well established. Currently only repositories for low- and intermediate level waste are operational (e. g. France, Finland and Sweden). High-level waste has first to be cooled down at interim storage facilities. The most advanced repository projects are in Finland, France and Sweden (see p. 39-40 of this Bulletin for the extended abstract of this presentation).

- Dr. Michael Schnellmann (NAGRA, Section Head Geosciences): *Deep geological disposal of radioactive waste in Switzerland – overview and outlook.*
  The speaker started with introducing NAGRA (see footnote on last page), a company with about 100 employees of which 30 geoscientists. In the main part of the talk he explained the three-stage work plan for site selection for high- and for medium/low-radioactive waste. Stage 1 is completed; the government accepted in 2011 the recommended six siting regions. Stage 2 involved reprocessing of seismic and gravity data, shooting of new seismic, logging in 3rd party boreholes and also studying the possible incision of main rivers over a long time, which entailed a detailed study of Quaternary deposits in northern Switzerland. It resulted in the proposal of two of the six siting regions,

for which, in Stage 3, a 3D seismic campaign (2015/16), drilling of several deep boreholes (2017–19) and extensive investigations of the Quaternary will be carried out (see p. 31-38 of this Bulletin for the extended abstract of this presentation).

- Dr. Herfried Madritsch (NAGRA, Project Manager Field Investigations): *Geology of northern Switzerland and key question regarding the region's seismic exploration.*
  The presentation concept was a journey through time, focussing on (1) the tectonic model of the Late Palaeozoic trough in northern Switzerland, which is entirely subsurface; (2) the stratigraphy of the Mesozoic, which contains the envisaged Opalinus Clay host rock for the repositories, but also features important facies changes of the strata just below and above it; and (3) the Late Cenozoic deformation processes throughout the area, in particular the formation of the Jura fold-and-thrust belt, which largely shaped the tectonic units presently observed (see p. 3-15 of this Bulletin for the extended abstract of this presentation).

- Dr. Beat P. Meier (Proseis AG): *New insights from the 2D reflection seismic 2011/12 into structural and stratigraphic aspects of central Northern Switzerland.*
  The three focus themes of H. Madritsch's presentation were detailed based on the interpretation of over 50 recently reprocessed and 20 new 2D-seismic profiles acquired in 2011/12. For seismic horizon and fault mapping, a qualitative three-level classification of interpretation uncertainties was used. The interpretation of the Late Palaeozoic Trough is considered conceptual, i. e. the outlines of the trough can be indicated on seismic, but the details on the bounding faults are missing. In the Mesozoic section more detailed seismic facies characteristics and depositional structures could be interpreted than previously observed. The definition of regional and local fault zones could be further improved (see p. 17-29 of this Bulletin for the extended abstract of this presentation).
- Dr. Bernhard Gunzenhauser (SASEG Vice-President): Logistic details of the convention excursions.

The meeting closed at 6 p.m.

III Partners' Programme: Guided tour of Baden

Whilst members convened for the General Assembly, sixteen partners of members explored on foot, with German/English guide Fredy Hauser, the old part of the town of Baden (Fig. 2/2). Highlight was the visit of the «Tagsatzungssaal» in the city hall, where the diet of the Swiss Confederation met regularly from 1426 to 1712 to settle matters relating to the lands conquered by the old Swiss cantons. This made Baden the *de facto* capital of Switzerland during that period. Other sites visited included the 56 m high northern gate tower built in the 15th century, which served as a prison until the 1980s, the Catholic city church and the lion fountain created in 1822; the lion is positioned such that it «growls at the gate tower and points his buttocks towards the Catholic church».

IV Evening

At 7 p.m. convention participants gathered in the lobby of Hotel Du Parc for the cocktail reception. Right from the start animated talks amongst members and partners were underway and cocktails sponsored by NAGRA were enjoyed.
At the beginning of President Peter Burri's traditional short address he honoured Dr. A. Jordi for 65 years of membership with VSP/SASEG by presenting him, accompanied by a big round of applause, with the association's commemorative membership certifi-

cate (Fig. 2/3). Then P. Burri talked passionately about the role for SASEG in a society where the opinion and the standing of scientists are increasingly challenged (Fig. 2/4). The easy access to almost unlimited internet information leads to a situation where everybody knows everything and experts are apparently no longer needed. In addition we are moving in the direction of a self-centred NIMBY- or a «selfie»-society in which only the individual counts and where larger projects, especially in the domain of energy, become increasingly difficult to realize. As an example he mentioned the opposition against domestic gas production in Europe, where gas still covers a quarter of the energy demand and where local production would make much more environmental sense than transporting gas over thousands of kilometres from North Africa and Siberia to the consumer. Like last year he pleaded to all present to make our voice heard for a scientifically correct and factual discussion of our energy options, which should not be left to politicians alone. Finally P. Burri touched on the history of Baden, already popular with the Romans because of the hot sulphur springs (Aquae Helveticae). The town had another high time in the 19th century, when the baths served as a social outlet; no surprise that the first railway constructed entirely on Swiss soil connected Zürich with Baden (1847).
The subsequent dinner was served in a somewhat sterile function room of the hotel; however, the food was good and the discussions at the round tables lively (Fig. 2/5).

Excursions

Sunday 21st June: Key Jurassic outcrops in the lower Aare Valley

This excursion focused on facies and deformation of formations of Jurassic age that under- and overlie the Opalinus Clay Formation, the preferential host rock for disposal of radioactive waste in Switzerland according to NAGRA. It also demonstrated the 2011/12 high-quality seismic data and its interpretation. At the outcrops we were generally split into four groups led by Dr. H. Madritsch, Dr. B. Meier, Dr. M. Schnellmann (all three were presenters on the previous day) as well as HOLCIM's former chief geologist Dr. W. Heckendorn. A 26-page excursion handout with numerous colour illustrations of maps, cross-sections, stratigraphic sections, outcrops and seismic sections was prepared and printed free of charge for each participant by NAGRA.
At 8 a.m. 75 participants boarded two coaches in front of the Convention hotel; the weather was grey and wet. We made our way to the historic Habsburg Castle, from which the once mighty Habsburg family hailed (Fig. 2/6).

Habsburg: Well equipped with our rain gear we assembled on the terrace to listen to H. Madritsch's explanation of the area's tectonic setting, which was supported by large-scale print-outs of the 2011/12 regional seismic lines and derived geological profiles (Fig. 2/7). This supplementary material was very much needed given that the advertised spectacular panoramic view was unavailable due to the mist and rain at the time of our visit.

Frick, Gruhalde: In this large clay pit of a cement factory we examined the sequences underlying the Opalinus Clay Formation, i.e. the uppermost Triassic (upper part of Keuper) and the Lower Jurassic. At the base of the exposed sequence fluvial channel deposits of the Schilfsandstein crop out. This is overlain by variegated marls formed on a former floodplain, separated by an intercalated dolomite marker bed of marine origin into an upper and lower part. We were fortunate to see a team led by Dr. Ben Pabst at work, excavating skeletons of *Plateosaurus* discovered near the top of the variegated marls just a week prior to our visit. Remains of this plant-eating, 8 m long

dinosaur occur here at an unusually high density; one of the skeletons has been offset by a fault of 1 m throw (Fig. 1).

Also the Lower Jurassic is dominantly clayey, though deposited in an open marine environment, and contains some very fossiliferous beds. A normal fault with 4 m offset is visible in a bed of limestone (Arietenkalk, part of the Beggingen Member of the Staffelegg Formation) but not in the overlying claystones where it has been compensated. Within such hard beds small-scale faults can potentially favour lateral fluid transport.

Rain accompanied us during most of the clay pit visit. The muddy slopes transformed our footwear (Fig. 2/8).

Holderbank, Schümel: This stop was a former quarry of the HOLCIM Group for cement, now a nature reserve. The exposed sequence ranges from the upper Middle Jurassic to the lower Upper Jurassic and constitutes structurally the back limb of the Chestenberg Anticline. For the most part it is steeply dipping to the south and even thrust in places. We inspected stratigraphic, sedimentological and tectonic features. A condensation horizon at the boundary

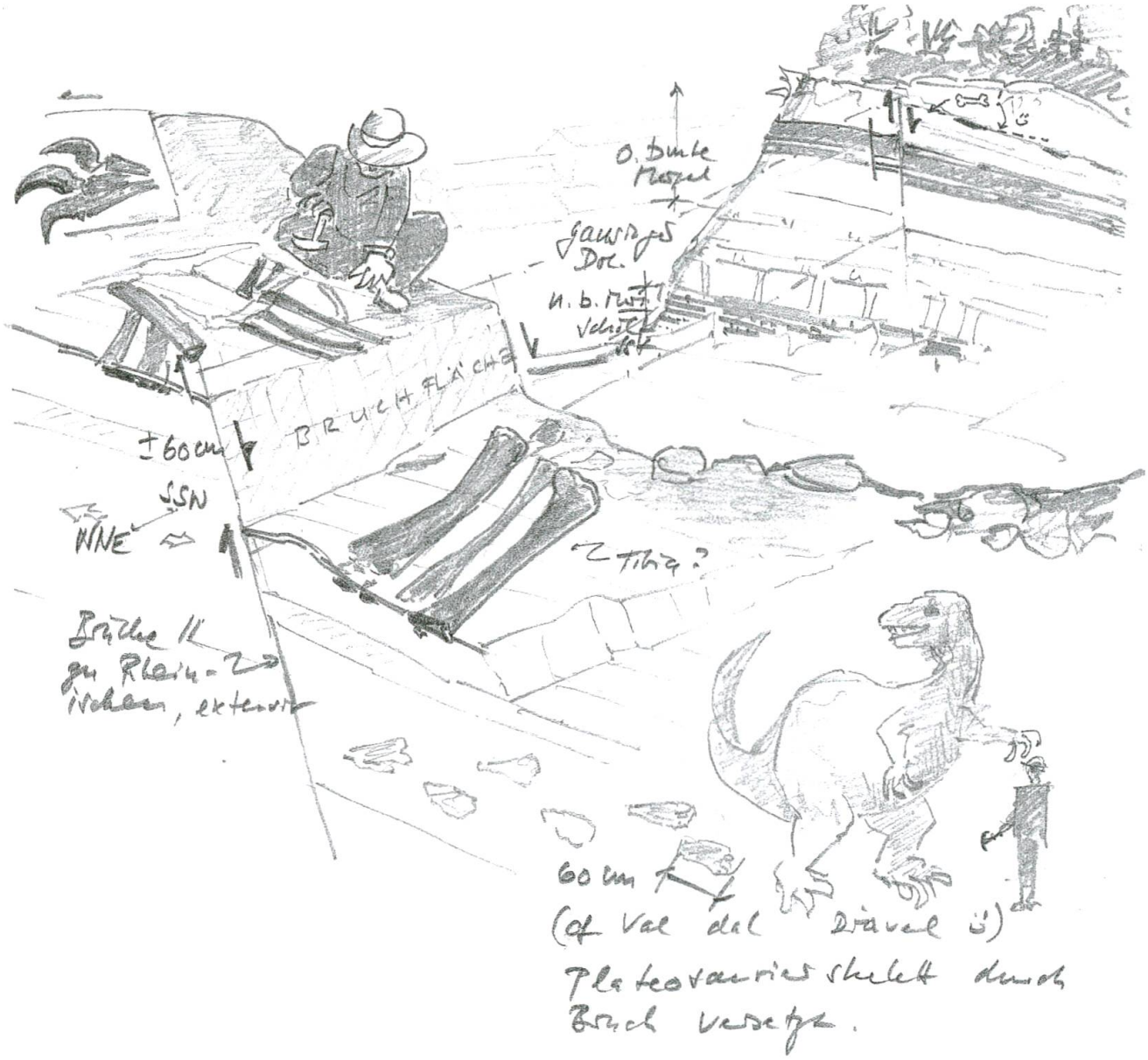

Fig. 1: At the Gruhalde claystone pit in Frick we could follow the ongoing excavation of a large *Plateosaurus* skeleton that was offset by a normal fault, which was visible also in the south wall of the pit (upper right) (Drawing: Urs Eichenberger).

between Middle and Upper Jurassic is spectacularly exposed (Fig. 3/9). It represents a hiatus of some 10 million years. We also took a closer look at the Effingen beds that are part of the lower Upper Jurassic Wildegg Formation and were proposed as another potential host rock for low and intermediate radioactive waste. However, the Opalinus Clay Formation is much more homogeneous; continuous calcareous intercalations exist within the otherwise marly Effingen beds. These calcareous intercalations must be regarded as potential fluid pathways; we observed joint systems at the quarry faces.
Soon afterwards we enjoyed, at restaurant Röstifarm, the signature Rösti dish, pancakes of grated cooked potatoes, and dried ourselves from the rainy morning (Fig. 3/10).

Above Villigen: In the village of Villigen we transferred from the coaches to a couple of minibuses that transported us in groups up the hillside above the village, on a special-permit forest road. From there we walked downward and examined, at small forest outcrops, the members of the Upper Jurassic Villigen-Formation from the top down (Fig. 3/11). These were shallow-water limestones and featured vertical slickolite surfaces. For easy orientation, W. Heckendorn and B. Gunzenhauser had placed labels of the lithostratigraphic units to all outcrops prior to our visit.
Just above the Pinot Noir and Riesling × Sylvaner vineyards we had a good view across the lower Aare Valley; the rain had stopped in the meantime. This was an excellent place for Dr. Madritsch to explain the structuration of the area on some of the 2011/12 regional seismic lines (Fig. 3/12). North of the Main Jura thrust anticline there is the gentle Siggenthal Anticline and further north the regional Mandach Thrust, all underlain by the Late Palaeozoic trough. The hill straight across the Aare Valley is capped by river gravels (Höhere Deckenschotter) deposited some 2 million years ago. These and other Quaternary terrace deposits allow reconstructing the Quaternary landscape evolution and will also be used by NAGRA as geomorphic markers for neotectonic investigations.

South of Böttstein: At this last stop of the day we gathered – in late afternoon sunshine – at the bank of the Aare River just upstream of Axpo's 365 MW Beznau nuclear power plant, the world's oldest operating nuclear power plant (Fig. 3/13). The cut bank on the other side of the river exposes braided river gravels. For this area a high-resolution (0.1 m) digital terrain model was constructed based on LiDAR data, which found no evidence for tilting of the gravels by movements along the underlying Mandach thrust fault since their deposition in the Latest Pleistocene. The newly acquired regional seismic lines, with CDP distances of only 3 m, image the shallow levels very well. Two neighbouring profiles were shown to us to illustrate the Mandach thrust's lateral change in structural style across the lower Aare Valley: From west to east the structure develops from a shallow dipping thrust into a normal fault that shows signs of a compressive overprint and is therefore interpreted as an oblique ramp.
Here Peter Burri thanked the leaders for a well-prepared and successful field trip despite the wet conditions in the morning, and thanked in particular for showing large print-outs of the excellent seismic data.
At 5:55 p.m. the coaches brought us back to Baden, where the participants had time to further explore the town and enjoy in small groups dinner in one of the many restaurants.

Monday 22nd June: Visit to the Mont Terri Rock Laboratory (Saint-Ursanne)

At 8:15 a.m. 49 participants left Baden in one coach and a few private cars. On the 1¾ hrs drive to Saint-Ursanne SASEG Committee members pointed out Switzerland's largest

salt production site at Rheinfelden; the village of Kaiseraugst, founded as Augusta Raurica in the 1st century A.C. by the Romans; outcrops of Middle Jurassic oolithic limestones at the flexure of the Rhinegraben; Bärschwil, the birthplace of pioneer stratigrapher and palaeoecologist Amanz Gressly (1814–1865); the anticlines of the Folded Jura; the Delémont Basin with Oligocene and Miocene fluvial deposits originating from the Vosges Mountains that were deposited prior to the formation of the Folded Jura; and the envisaged site for drilling a deep, deviated petrothermal well in the Delémont Basin. Also, the history of the formation of the *République et Canton du Jura*, the only canton of Switzerland created after 1815 (in 1979), was explained.

At the Rock Laboratory's visitor center we were welcomed with coffee and croissants. Shortly afterwards the project was introduced to us by its leader, SASEG member Dr. Paul Bossart. The Mont Terri Rock Laboratory is a generic laboratory in claystone, about 300 m below the earth's surface and accessed through the security gallery of the Mont Terri tunnel of the A16 motorway. The first experiments in 1996 were carried out in eight small niches along the security gallery[ii]. A separate, dedicated research gallery was then constructed in 1998; additional galleries between 2003 and 2008. A further extension of the laboratory is planned for 2018–2020. The research galleries have a total length of 600 metres. They are entirely in the Opalinus Clay Formation, which is here about 150 m thick. The infrastructure is for research purposes only; disposal of radioactive waste in the facility has been explicitly excluded in the contract between the laboratory partners and the Canton du Jura.

In the galleries the Opalinus Clay dips 30–45 degrees to the south-east and is displaced by (tectonic) fault zones. Clay minerals make up 40 to 80% of the formation; 10% of these are swelling clays. Permeability is very low; the (saline) pore water is practically immobile.

Sixteen organizations from Switzerland, the EU (mainly D, F, E, B), Japan, Canada and USA, which all consider clay formations as potential host rocks for deep geological disposal of radioactive waste, are involved in the underground experiments. The Federal Office of Topography (swisstopo) was asked by the Canton du Jura to operate the facility and to direct the Mont Terri project. Every year the partners have the opportunity to decide which particular experiments they wish to participate in.

Recently the Mont Terri Rock Laboratory has also opened to «energy experiments» such as CO_2 disposal (well integrity experiments) and geothermal experiments (monitoring of seismicity during hydraulic stimulation).

The Rock Laboratory is open to the public (for pre-arranged group tours) as part of its mission to explain the concept of deep disposal to the public.

After the introductory talk we donned helmets and badges (Fig. 3/14) and entered minibuses that brought us into the tunnels of the rock laboratory. There we split up into four groups led by Dr. Paul Bossart, Dr. Senecio Schefer (both SASEG members), Dr. David Jaeggi and Dr. André Lambert, to examine for 1½ hours the Opalinus Clay Formation and many of the 45 ongoing experiments (Figs. 3/15 and 3/16).

In the Opalinus Clay we observed the main thrust fault (which is a blind thrust), without any evidence for water flow. It was associated with slickensides. We also saw the ammonite *Leioceras opalinum* that gave its name to the formation.

The experiments are focused in three main areas:

(1) Methodology development relating to the properties of the Opalinus Clay: These include measurement of porewater pressure and permeabilities and collection of water samples; drilling and core sampling techniques; determining the stress field in the rock; and the effect of coupled processes.

(2) Characterisation of the Opalinus Clay: The main aspects of interest are its permeability and ability for self-sealing, as well as the diffusion behaviour of radionuclides in the clay. We saw entire tunnel faces penetrated by numerous drillholes in the pattern of Emmental cheese (Fig. 3/15). With the drillhole covers removed we could inspect the holes and see e. g. how much of the original damage to the host rock during drilling the hole has already been healed. We also saw giant cores (diameter 60 cm) from a radionuclide diffusion experiment. An isolated test interval in a small borehole was saturated with water and a defined volume of radioactive tracer (e. g. tritiated water, caesium, or cobalt) added. After five years the small borehole was overcored and in the larger-diameter core measured how far the tracer had penetrated into the rock.
(3) Demonstration experiments: These are used to test procedures for emplacing waste containers and for sealing tunnels under realistic conditions. We saw an experiment where a large (full-scale) container (filled with barite, not waste) had been emplaced and the space between it and the tunnel wall backfilled and sealed with granular bentonite. Observations are carried out over many years to determine how the different backfill materials and also the steel canister alter on contact with porewater. Another experiment we visited, NAGRA's largest, simulates a repository of fuel rods, which were emplaced in a 50 m long tunnel and embedded in bentonite; the rods are heated electrically to simulate the heat from radioactive decay (Fig. 3/16). A third experiment tested whether the hydrogen gas supply from corroding steel activates sulfate-reducing bacteria; during this experiment two indigenous species of sulfate-reducing bacteria were found although pore space is only 40 nanometres.
Our guides emphasized that at a site proposed for a repository experiments have to be conducted as well because e. g. the stress field at such a site is likely to be considerably different from that at the Mont Terri Rock Laboratory.
After this subterranean visit we reconvened at the Hotel de la Couronne in Saint-Ursanne (Fig. 3/17). Before lunch was served, President Peter Burri thanked today's leader and the SASEG organizing committee for an excellent, well-run Convention and asked all of us to meet again in June 2016 in Heidelberg.
However, this was not yet the end of the Convention: After lunch most participants joined the offered walking tour of Saint-Ursanne. A French- and a German-speaking guide led us through the streets of this small medieval town and onto the bridge crossing the Doubs river adorned with a statue of Saint John of Nepomuk, the Bohemian martyr. The highlight of the tour was the visit of the ecclesiastic complex comprising the Collegiate Church (with the celebrated Romanesque, polychrome South portal), the cloister and many stone tombs in a former church.
Afterwards several participants left the group, returning home individually, by train; the others reached Baden by coach at 17:45 hrs.

Acknowledgments

Sincere thanks to P. Bossart, P. Burri, A. Gautschi, H. Madritsch, B. Meier and M. Schnellmann for improving sections of an earlier draft and to the mentioned photographers and artists for making photographs and drawings available.

---

i NAGRA (**Na**tionale **G**enossenschaft für die Lagerung **r**adioaktiver **A**bfälle; National Cooperative for the Disposal of Radioactive Waste) is Switzerland's technical competence centre in the field of deep geological disposal of radioactive waste. It was founded in 1972 by Swiss producers of radioactive waste and is currently funded by six energy companies, a company operating a temporary storage facility for radioactive waste and the federal government.

ii Most of the subsequent text on the laboratory is taken from the flyer Mont Terri Rock Laboratory – Research of deep geological repository, swisstopo, May 2012.

Fig. 2: Selected illustrations of the 2015 SASEG Convention. 1–5] 20th June, Hotel Du Parc, Baden. [1] At the General Assembly, retiring treasurer Werner Heckendorn explains the association's balance sheet for the last time ... (Photo: H. M. Bürgisser); [2] ... whilst partners of members enjoy the guided tour of the old part of Baden (Photo: J. Burckhardt); [3] At the cocktail reception, President Peter Burri honours Res Jordi for 65 years of VSP/SASEG membership ... [4] ... and then has an attentive audience during his short address (Photos: B. Gunzenhauser); [5] Cheerful mood at the association dinner (Photo: H. M. Bürgisser). 6–8] 21st June, excursion Lower Aare Valley. 6–7] At the first stop, the historic Habsburg, we assembled on the terrace to inspect seismic sections and corresponding interpretations and to listen to Dr. Herfried Madritsch's explanation on the structuration of the area (Photos: P. Reichetseder, H. M. Bürgisser); [8] Our exploration of the Gruhalde claystone pit in Frick (see also Fig. 1) was a muddy affair (Drawing: Martin Ziegler)!

Fig. 3: Selected photographs of the 2015 SASEG Convention. 9–13] 21st June, excursion Lower Aare Valley (ctd.). [9] At HOLCIM's former cement quarry Schümel, Dr. B. Meier points to a 10-Ma hiatus in the Middle Jurassic (Photo: H. M. Bürgisser); [10] Lunch at Restaurant Röstifarm (Photo: B. Gunzenhauser); [11] Dr. M. Schnellmann explains outcrops of the Upper Jurassic in the forest above Villigen (Photo: P. Reichetseder); [12] Dr. H. Madritsch elucidates on the interpretation of one of the new seismic lines, held up by Vice-President Bernhard Gunzenhauser (Photo: H. M. Bürgisser); [13] Last stop of the day at the Aare River near the Beznau nuclear power plant (Photo: B. Gunzenhauser). 14–17] 22nd June, excursion to the Mont Terri Rock Laboratory near Saint-Ursanne. [14] Helmet and safety badge were mandatory in the rock laboratory (Photo: P. Reichetseder); [15] Numerous holes were drilled into this large Opalinus Clay tunnel face, for a variety of experiments (Photo: U. Eichenberger); [16] Model of the present Swiss repository concept for high-level radioactive waste. The steel canister in the center contains the burnt fuel. The space between the steel canister and the rock is filled up with granular bentonite (Photo: H. M. Bürgisser); [17] The visit created a lot of discussion during the subsequent lunch (Photo: B. Gunzenhauser).