Fifty-five years of continuous Permian-Triassic field research and corresponding publications by Aymon Baud, in collaboration with the Geological Institute of Lausanne University, Switzerland, 1968-2023

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This illustrated text has been prepared for the conference "Across the End Permian 'Great Extinction': from Permian-Triassic Field Studies to Scientific Results" held August 30- September 2, 2023, at University of Lausanne, Switzerland. This conference is to reflect, celebrate, and pay tribute to Dr. Aymon Baud', fifty years of continuous Permian-Triassic field research and corresponding publications produced in part with the Swiss National Science Foundation (FNSRS) and other State Foundations help, and in association with the Geological Institute and Museum at Lausanne University, Switzerland. It shows 5 periods with each subdivided into 8 to 12 chapters.

1 – The first period from 1968 to 1984

This first section focuses on 17 years of PhD study, extremely beneficial collaboration with colleagues and professors, publishing of field and laboratory research, and successful doctoral presentations.

1.1 – PhD study on Middle Triassic carbonate succession from Prealps to western Alps, 1968-1984

On April 22, 1968, I received my Master diploma in Geology, and I decided to begin my PhD studies on the sedimentology and stratigraphy of the Middle Triassic carbonate succession of the internal Swiss Pre-Alps domain.

With my appointment as graduate assistant of Professor Héli Badoux, I began my studies at the Saint-Triphon quarries in the Swiss Rhône Valley and continued the work of Professor of Geology François Ellenberger (La Sorbonne, Paris), who was the first to correlate the Triassic succession of the Swiss Prealps with the Triassic succession of the internal part of the Western Alps known as the "Briançonnais".

I first got in touch with Dr. Francis Hirsch, a paleontologist from Zurich University, and together we sampled and logged the Anisian flinty limestones. Through dissolution, he discovered conodonts. My first co- authored publication resulted from this (Baud et al., 1968).

I was invited to work as an assistant at the Lausanne Geology Museum in 1972, and I was named the museum's curator in 1974. After conducting field research, Dr. Henri Masson and I worked together to find what appears to be Switzerland's oldest vertebrate fossil in 1974 (Baud, 1975). Our work then continued on paleotectonics (Baud & Masson, 1975, 1976 ; Baud et al., 1977). My next papers were on Decapoda (Baud, 1976) and on my view on the Triassic stratigraphic scale (Baud, 1977).

On the Permian-Triassic boundary, a first collaboration with my colleagues Demir Altiner, Jean Guex and Gérard Stampfli led to correlations in several Middle Eastern localities and the discovery of stromatolites at the base of the Triassic (Altiner et al., 1980). This discovery is developed in chap. 3.8.

For clay study in my Triassic carbonate, I started a collaboration with Professor Bernard Kubler from Neuchâtel University, and his short course on clay mineralogy greatly aided the mineralogical study of clay content in Anisian limestones and with illite crystallinity, the anchi-metamorphism zones of the Prealps Triassic (Baud, 1984).

I pursued numerous collaborations up to 1983, which gave me the opportunity to contribute to the 22 articles that were published as well as to write the 300 pages of my thesis manuscript (Baud, 1984, 1987) while continuing, during summers, to map the Triassic succession on the Niesen, Adelboden (Furrer et al., 1993) and Zweissimen maps of the Swiss geological Atlas 1 :25,000. In Dec. 1984, I defended my PhD work with an appendix of these 22 published articles on "The Natural History of the Saint-Triphon limestone (Anisian, middle Triassic, Swiss Prealps)", and obtain the Jury congratulations.

1.2 – Collaboration with Professor Paul Brönimann of the University of Geneva and his Assistant Dr. Louisette Zaninetti

A fruitful collaboration with Professor Paul Brönimann of the University of Geneva and his PhD assistant Louisette Zaninetti, who specializes in Triassic foramininifera, was launched when I began mapping, logging, and sampling numerous Anisian outcrops in the Prealps. I then began studying the thin sections and discovered a wealth of foraminifera, microfossils that had never been described in these regions. The results were the publication of six paleontological papers (foraminifera and coprolites) on Prealps Anisian limestones from 1971 to 1974 (Baud et al., 1971, 1972, 1974 ; Broennimann et al., 1972 ; Zaninetti et al., 1972a, b).

1.3 – Field works out of Europe, the start of Permian study in Iran and Pakistan, 1972-1975

I had the good fortune to continue working closely with Paul Brönimann and Louisette Zaninetti, and in October 1972 and October 1974, they invited me to conduct fieldwork on Permian-Triassic strata in Iran (Baud et al., 1972, 1974). Our field research success in March 1975 focused on the Pakistan Salt- and Trans-Indus Ranges Permian-Triassic (Fig. 1). Key stratigraphic sections were well sampled and were initially kept at the Geneva Paleontological Institute before being transported to the Lausanne Geological Museum.

1.4 – Collaboration with Dr. Joséphine Mégard-Galli, assistant to Prof. Ellenberger from Paris-Sorbonne

In 1972, J. Mégard-Galli and I began another productive collaboration in which we jointly investigated some of the outstanding Triassic outcrops in the Western Alps Briançonnais region as well as Middle Triassic carbonate on Corsica and Sardinia (Baud et al.,1977). This led to extremely precise correlations of the new established Saint-Triphon Formation and the units surrounding it, of Lower and Middle Triassic age, from central Switzerland across the western Alps to the Mediterranean.

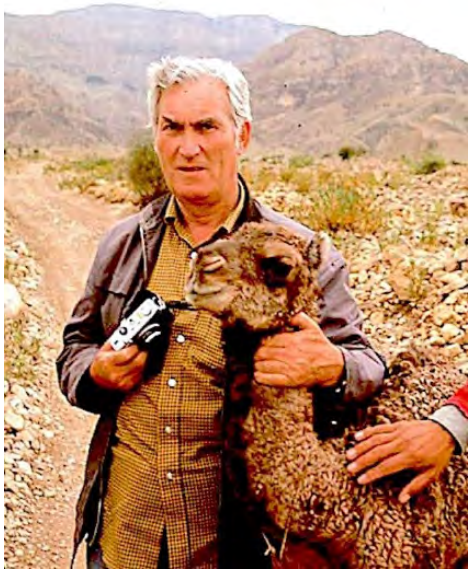

Figure 1 : Professeur Brönimann at Narmia Nala (Pakistan)

We can describe these correlations and provide new methods based on the cyclicity of carbonate sedimentation and the most important recently identified transgressive-regressive sequences thanks to several presentations at international conferences and several publications (Baud & Mégard-Galli, 1975, 1977 ; Mégard-Galli & Baud, 1977). With her, the stratigraphy and sedimentology of the Briançonnais Triassic underwent significant advancements, and she was instrumental in the development of a synthesis of the Triassic of the Western Alps that was published in the 1994 Mémoires du BRGM (Mégard-Galli et al. 1984).

1.5 – Himalaya-Ladakh field studies : started first with the Lausanne Geological Institute, followed by cooperation with Grenoble and Milano colleagues, 1977 to 1983

In early 1979, I initiated a Lausanne Himalayan research group. With Prof.A. Escher, H. Masson and A. Steck, I co-organized the first eastern Zanskar geotraverse Hemis-Padum in 1979 (Fig. 3) and results were published in Baud et al., 1982, 1983.

We organized an expedition to conduct in-depth stratigraphic sections and tectonic investigations in central Zanskar, N and E of the Spongtang ophiolite Klippe, in 1981 with Prof. G. Mascle from Grenoble) and Dr. E. Garzanti from Milano (Baud et al., 1985 ; Garzanti et al, 1987).

I took part in a SE-NW geotraverse from Darcha (Lahul) to Thongde (Zanskar) in 1983 at Prof. M. Gaetani's (Milan) invitation, passing through Sarchu, Phirtse-La, and Phugtal (Baud et al., 1984).

Figure 2 : Dr. Joséphine Mégard-Galli in the field, August 1970.

Figure 3 : Crossing Lungtung River (Ladakh, Himalaya), 4600m high, during Hemis-Padum geotraverse.

The main results obtained in collaboration with the above-mentioned teams can be summarized as follows :

1. The discovery and definition of large-scale SW vergent nappes structure in the Zanskar sedimentary belt (Tethys Himalaya).

Despite fierce opposition and disagreements regarding the nappe's idea from geologists with an autochthonous mindset, extensive fieldwork and mapping have recently largely validated the theory's structure.

2. A geological profile through E Zanskar, from Hemis to Padum.
3. Detailed stratigraphic sections of late Cretaceous and early Tertiary sediments of central Zanskar with the geodynamic interpretation of sedimentary record of the northward flight of India.

The rest of this cooperation is described in chapter 2.9.

1.6 – Continuing geological and stratigraphical education provided by international Conferences, 1971-1984

I chose to participate in the international Congress so that I could stay up to date on the most recent developments in sedimentology and stratigraphy. I participated in a Triassic excursion to the Northern Limestone Alps of Bavaria in 1971, immediately after the 8th International Sedimentological Congress in Heidelberg (Dachstein, Hallstadt, Hauptdolomit, Kössen beds). In 1971, I received a good training in Triassic stratigraphy and continued research outside of the Western Alps.

I attended the 9th and 11th International Sedimentological Congresses in Nice in 1975 (Baud, 1975) and Hamilton in 1982 (Baud, 1982), respectively, and I paid a visit to Dr E.T. Tozer in Ottawa (Fig. 4).

Figure 4 : Visit to E.T. Tozer and his wife, left, in Ottawa, August 1982.

I was given the chance to attend the 27th International Geological Congress (IGC) in Moscow in August 1984, as well as the official meeting of the Sub-Commission on Triassic stratigraphy (STS), where I was appointed as the new Vice-Chairman.

Two successful fieldtrips on Permian-Triassic boundary of new areas, the Setorym Creek in Verkoyansk Mountains (East Siberia) and the Vedi and Sovetachen sections in Transcaucasus (Armenia) were organized before and after this 1984 IGC in Moscow. It was a unique opportunity for

participants to collect samples of these remote sections. This has enriched the museum's collections for future research, and which we describe in chapters 2.4, 5.7, 5.8 and 5.10.

1.7 – Visit of new geological sections and sampling provided by the Triassic projects of the International Geological Correlation Program (IGCP) of UNESCO

My involvement in IGCP Projects 4 and 106 began with field workshops in Bergamo (1979), Bratislava (1980), Sarajevo (1981), and a final meeting in Vienna (1982). The 1979 gathering was organized by Isabella Premoli Silva and Maurizio Gaetani in honor of R. Assereto and J. Pisa, and it was held in the renowned Bergamo castle (Italy), where I gave a talk (Fig. 5a). In 1980, the IGCP Project 4 on the Triassic realm organized a field meeting in Bratislava (Slovaquia) with excursion in eastern part of the country and in 1981, the IGCP Projects 4 and 106 organized a field meeting in Sarajevo (Fig. 5b).

Figure 5 : a) I give a talk in Bergamo castle, 1979, b) Picture of Anisian red ammonoid limestone (Han Bulog) near Sarajevo, 1981.

The opportunity to participate in the first Chinese IGCP Project 203, "Permo-Triassic events in the Eastern Tethys", proposed and directed by Prof. Zun-Yi Yang, came about in March 1984. It started with a successful conference in Beijing, followed by the fieldtrip to Shangsi section (see chap. 2.2).

1.8 – New collaboration with Professor Dimitri Papanikolaou of the University of Athens

At the invitation of Professor Dimitri Papanikolaou of the University of Athens, I started research in Greece in 1980 and 1981, sampling new Permian-Triassic sections from the islands of Salamis, Hydra, Chios and Aegina, as well as the Permian of Attica, Eastern Greece (Baud & Papanikolaou, 1981). Our results were presented in two meetings as shown below. During the following periods, cooperation with him and new research teams continued in Greece (see chap. 2.3).

2 – The second period : 1985-1992

The second period from 1985 to 1992 presents a different narrative : I embarked on four research programs. I pursued a multi-collaboration on Permian-Triassic study and new lines of research emerged.

In 1985, I was requested to teach carbonate sedimentological classes at the Geological Institute after taking over as interim director of the Geological Museum from the departing director, who had taken a sabbatical and in 1986, I was promoted to Director of the Lausanne Geological Museum.

2.1 – First Geotraverse, the Western Tibet, 1985

In 1985, I took a sabbatical to participate in the first authorized expedition to Western Tibet. This region of high plateau and deep valleys, which had always been closed to Westerners, gave me the opportunity to participate in a unique geo-traverse from the High Himalayas to the Kun Lun range, and to make geological observations before joining the plains of Central Asia along the Silk Road.

After this, I spoke at the Istanbul meeting at Prof. Celâl Sengör's invitation and I also published in Baud, (1985,1989a ; Baud et al., 1994), detailing my observations made in the Kailas region and along the Sutlej-Yarkand geotraverse.

2.2 – The Triassic projects of the International Geological Correlation Program (IGCP) of UNESCO

My involvement in IGCP project continued with field workshops in Istanbul and Antalya (Turkey, 1986), in Beijing and Nanjing (China, 1987), in Salt Range (Pakistan 1987) followed by a Kashmir trip (India) and finally in Vladivostok (E Russia, 1992).

In 1986, I co-organized the meeting of the Sub-Commission on Triassic stratigraphy (STS) (Fig. 6) and a field conference on the Permian and Permian-Triassic boundary in Istanbul, Turkey, as part of IGCP 203 with Jean Marcoux and Celâl Sengör.

Figure 6 : Meeting of the officiers of the Sub-Commission on Triassic stratigraphy (STS), with Celâl Sengör and Bill Holser in Istanbul, July 1986.

Jean Marcoux invited Leopold Krystyn and me on a trip to the Antalya nappes, west of Kemer (SW Turkey). J. Marcoux has studied the Permian and Triassic in this area for a long time (Marcoux et al., 1986 ; Marcoux & Baud, 1988).

I actively took part in two field workshops for the IGCP project 199 in 1997 :

- The first workshop took place in March and was led by Prof. Sun Shu of the Academia Sinica. We met in Beijing and Nanjing and had the chance to collect samples from the Changhxingian stratotype in the Meishan area, from the P/Tr boundary clay, and from the mixed beds (1 to 3) of the earliest Triassic (Boclet et al., 1988).
- The second was held in Pakistan's Salt Ranges in December to work on a crucial PT portion. I participated and gathered late Permian samples with my post-doctoral student C. Jenny.

Profs. M. Gaetani, J. Marcoux, and E.T. Tozer also participated. Together, we made the decision to travel to Kashmir (India) in order to conduct research at the well-known Guryul Ravine Permian-Triassic section and to gather samples for later study (Chap. 3.4, 5.4 and 5.10.

J.M. Dickins oversaw the Project 272, "Late Paleozoic and Early Mesozoic Circum-Pacific Bio-Geological Events", which followed the IGCP Project 203. Together, we assisted Profs. Yuri Zakharov and Galina Kotlyar (Fig. 7a) in September 1992, in organizing the first Permian-Triassic conference and field workshop in Vladivostok, Russia. It was sponsored by IGCP Project 272 and supported by STS. As co-organizers, we had the chance to travel to four major Permian-Triassic parts of this Far Eastern Russian region that were never accessible to scientists from western countries.

A published book was printed in 1997 (Baud et al., editors, 1997) and a correlation paper in Zakharov et al. (2005), see next in chap. 4.6.

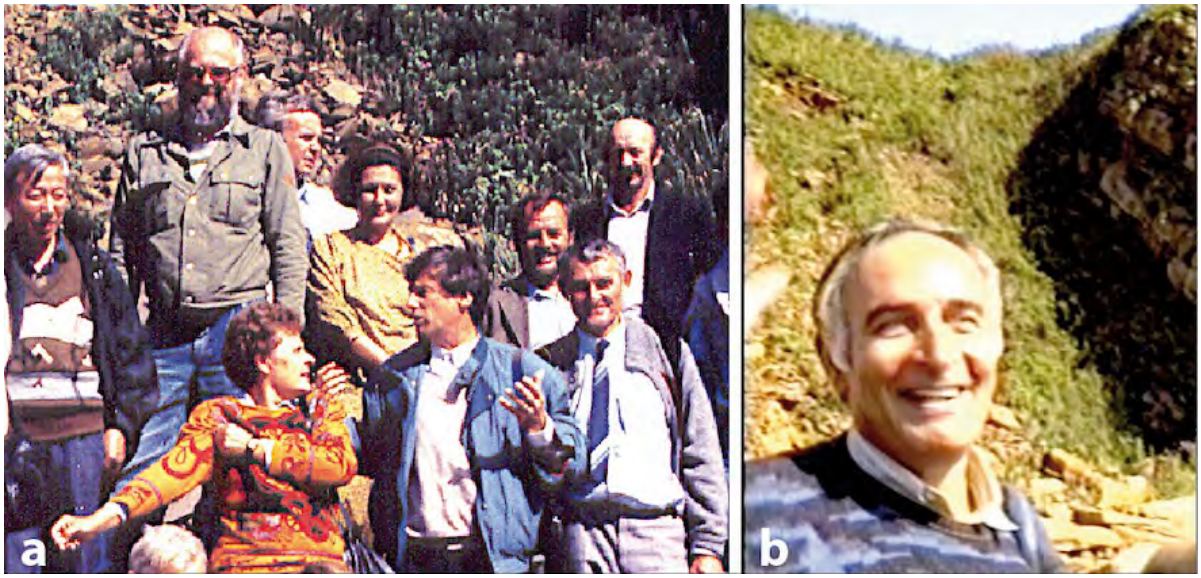

Figure 7 : The Vladivostok fieldtrip, 1992, a) Discussion between the author and G. Kotlyar in the front, Y. Zacharov on the right and H. Kozur on the back high, b) Guiseppe Cassinis say good bye !

2.3 – Micropaleontological studies of the Permian Tethys

I was granted permission to submit research proposals to the Swiss National Foundations (FNRS) for micropaleontological investigations of the Permian Tethys. In 1987, I get financial support for a post-doc assistant for Dr. Catherine Jenny, a specialist in Permian foraminifera investigations. Between 1987 and 1989, we began studying the Permian in Greece, at Professor Dimitri Papanikolaou's invitation. We made fieldworks on Permian of the islands of Chios, Aegina and new sections from Hydra and published four papers (Baud et al., 1990, 1991 ; Baud & Jenny, 1991 ; Jenny-Deshusses & Baud, 1989). In 1990, we worked along with K. Grant and M. Nestell to publish an achievement on the Permian study of Hydra (Grant et al., 1991) and later the Jenny's works (Jenny et al., 2004, 2009).

2.4 – From 1986 begins a new line of research : the Carbon isotope stratigraphy in collaboration with Profs William Holser (Eugen, USA) and Mordekai Magaritz (Rehovot, Israel)

I began working with Professors William Holser (Eugen, Oregon, USA) and Mordekai Magaritz (Rehovot, Israel), and I sent sample collections from important PTB sections between the S Alps, Turkey (Fig. 8) up to S China that I had examined and kept at the Lausanne Geological Museum to the Magaritz C isotope laboratory. We were able to build a new database on stable Carbone Isotope, to prepare talks for upcoming Permian-Triassic meetings and a key paper on Permian-Triassic C isotope stratigraphy (Baud et al., 1986 : Baud & Magaritz, 1988, 1989 ; Magaritz et al. 1988).

Boosted by IGC Project 199 with new sampling opportunities on key Permian and Triassic successions, we published, after analysis, twelve well dated sections with C isotope curve from bulk rock marine carbonate samples, showing in 1989, for the first time, the global shift at the boundary : a new tool for marine Permian-Triassic boundary correlation was open and 2 main PTB candidate sections, Meishan and Shangsi, were discussed and illustrated (Baud et al., 1989). The results exceeded our expectations and following an initial publication in the periodical "Nature", our article had a considerable impact and got high citation index.

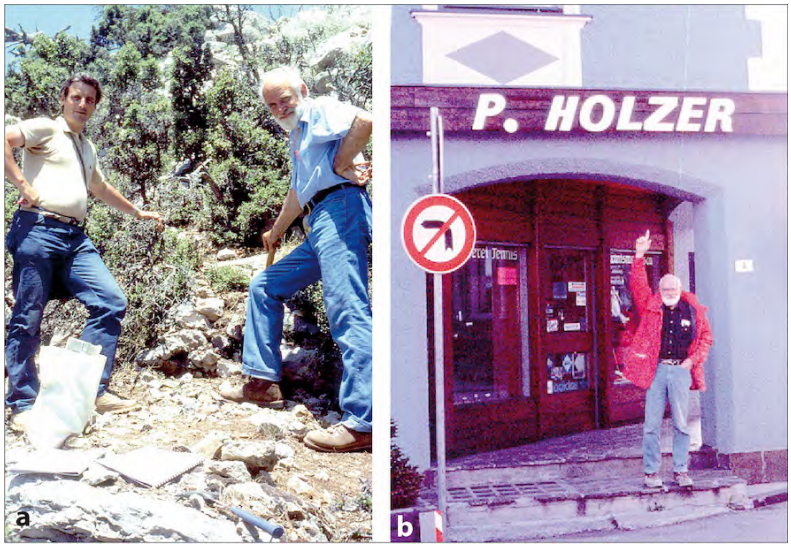

Figure 8 : Bill Holser , a) with the author on Curuck Dagh, (Turkey) outcrop, 1986, b) in front of a shop showing a "Holzer" name !

2.5 – From Vice-chairman to Chairman of the Sub-Commission on Triassic stratigraphy (STS)

I was elected as the new Chairman of the STS in 1989 during the International Geological Congress, which was held in Washington, D.C., after serving as vice-Chairman in 1984. I also received approval from the international committee on stratigraphy.

My duty was to organize a Triassic Congress and to promote Stage name and Stage boundary agreement. I proposed in 1991 that a Triassic Stratigraphic Symposium be held in Lausanne at the request of the Sub-Commission members. In October 1991, with assistance from the Museum's staff, the Geological Institute, and the University of Lausanne, I led this Symposium with the assistance of Jean Guex (Lausanne), Maurizio Gaetani (Milano), Jean Marcoux (Paris), Hans Rieber (Zurich), and others.

About fifty professionals from 22 different nations attended this symposium over the course of four days (Baud, ed., 1991). This was followed by a one-day local field trip to the Anisian Saint Triphon quarries and the Norian salt mine of Bex (Baud & Meisser, 1991). Following favorable voting, we decided to propose two Stages for the Lower Triassic period with the STS : Induan and Olenekian. Collectively, we participated in the editorial committee of the 1994 proceeding (Guex & Baud, 1994). Next is Chap. 3.6.

2.6 – Participation in International Geological Congress and Fieldtrip

I took part in the 1989 International Geological Congress that was held in Washington, D.C. I gave a talk there (Baud, 1989b) and took opportunity to participate in the West Texas Congress field trip and reconnected with Professor Norman Newell of the New York Natural History Museum (Fig 9).

Figure 9 : Norman Newell and the author : a) at the S China fieldtrip, 1984, b) at the West Texas fieldtrip, 1989.

In 1991, I took the opportunity to participate in the International Congress on Permian System of the World in Perm (Russia). I gave a talk on the Permian succession in Greece (Baud & Jenny, 1991) and participated in the Permian of Ural's fieldtrip. It was an opportunity to reunite with colleagues Professors Galina Kotlyar from St. Petersburg and Yuri Zakarov from Vladivostok after the 1984 International Geological Congress in Moscow and plan along with them for the 1992 Permian-Triassic International Field Meeting in Vladivostok (see 2.1- IGCP meeting).

In August 1992, while serving as the Chairman of the STS, I attended the International Geological Congress (IGC) in Kyoto and spoke at the Gansser Symposium about the "Neotethys opening in Oman" (Baud, 1992). Professor Augusto Gansser is being honored up front. After that, I traveled to Central Japan for a Permian-outcrops field trip and then joined the Vladivostok meeting (p. 48).

2.7 – The international research program «Tethys» with field works in Oman, Timor and W Texas

The year 1989 is the beginning of my involvement in a major international research program called "Groupement Scientifique Tethys" and the start of financially supported geological research in Oman, in Timor and in W Texas. With Prof. Jean Marcoux and Post-doc assistant Sylvie Crasquin, we established Permian-Triassic working groups. Several working meetings were held in 1989 and 1990, at the Museum in Lausanne and in Paris, respectively.

As part of this "Tethys" international research programs, Permian and Triassic samples were collected from 1989 (Baud et al., 1989) to 1992 in Oman and in 1991 from the island of Timor, Indonesia (Baud & Marcoux, 1991). To complete our data, we organized with Jean Marcoux field research on the Permian Basin of the W Texas (Baud & Marcoux, 1989).

With Gérard Stampfli, a new professor of geodynamics appointed to Lausanne, we took up the history of the Tethyan margins in space ad time, and published it, under his leadership (Stampfli et al., 1991). We also resumed work on samples from eastern Iran received from our Austrian colleague Anton Ruttner (Baud, Brandner et al., 1991, Baud, Stampfli et al., 1991).

Jean Marcoux oversaw the Triassic paleogeographical and paleoenvironmental maps working group (Anisian and Norian maps) and helped me greatly on my charge of the Permian, Murgabian map.

Results and paleogeographic maps of the "Tethys" international research programs were presented at a final meeting in 1992. The 3 maps with accompanying notes on Permian and Triassic environments produced by our research group (Baud et al., 1993 ; Marcoux et al., 1993a, 1993b) are part of large book printed at the end of 1992 with Dercourt et al. as editors. Permian-Triassic paleoenvironments were published also in Marcoux & Baud, (1996).

2.8 – Field works in Canadian High Arctic Lower Triassic stratotypes, via invitation by Prof. Benoit Beauchamp, July 1992

My first encounter with Prof. Benoit Beauchamp from Calgary University (Canada) took place at the Perm Conference in 1991, and he gave me two targets :

1. my participation,
2. my participation in Permian-Triassic field research in the Canadian High Arctic with support from the Geological Survey of Canada.

I accepted it with enthusiasm. With his formal invitation, at end of June 1992, I was able to join the Benoit Beauchamp field expedition in the Canadian High Arctic (Fig. 10), on Ellesmere and Axel Heiberg islands under the Geological Survey of Canada support. Profiles of Late Permian and Early Triassic type sections were studied and rocks samples from the Permian-Triassic transition was sent to the Lausanne Museum for analysis.

2.9 – Himalaya research group with Profs Henri Masson, Gérard Stampfli and Albrecht Steck

With our local research group on Himalaya with Profs H. Masson, G. Stampfli and A. Steck, we took the opportunity to organize the fourth Himalayan-Karakoram-Tibet workshop in Lausanne and organized a public exhibition on our Geological work and discoveries in Ladakh Himalaya in 1988.

I worked as the editor of the Conference Proceedings (Baud, 1989c) and published a response to G. Fuchs (Baud 1989d).

Figure 10 : a) Otto Fiord camp on Ellesmere Island, July 1992, b) Some participants with B. Beauchamp 3rd from left.

3 – The third period : 1993-2003

Three new study programs were initiated during the third phase, which ran from 1993 to 2003, and two new research lines were initiated, up until my retirement from the Geological Museum.

3.1 – The Pangea Project of the Commission on Global Sedimentary Geology(C-GSG) : 1992-2003

I was requested to co-produce Pangea charts and was given the opportunity to present an overview of European research on the disappeared ocean Tethys at the University of Kansas at Lawrence for the inaugural meeting of the international scientific initiative Pangea. The project Pangea was published in GSA Special paper 288 as shown by the "Introduction" below.

It was then decided that Project Pangea would focus on the most recent time of supercontinent accretion and dispersal, i.e., from the Carboniferous to the Jurassic, when continents merged toward a geoid low, and much of Pangea's climate appeared to be disposed in an icehouse mode (Baud, 1992 ; Ross et al., 1992). This project was part of the IUGS Program on Global Sedimentary Geology (P-GSG) chaired by B. Beauchamp and I collaborated with him for this Pangea project. Meetings were often associated with international Congress. In Aug. 15-19, 1993, the Pangea project held the "Tethys evolution during Pangea time Conference" in Calgary, Canada, organized by B. Beauchamp and A. Embry. I was asked to be responsible for one of the conferences themes, and I organized and led one of the sessions. I also gave two lectures (Baud, 1993a, b) and contributed to the presentation of four posters (Baud et al., 1993 ; Marcoux & Baud, 1993 ; Marcoux et al. 1993b, d).

The following Pangea summit took place as IGCP Project 359 in Guiyang, China, from August 28 to August 31, 1994, during the International Symposium on Permian (ISP). I participated in the work of the international sub-commission on Permian stratigraphy and presented a paper at the Guyang Congress (Fig. 11), as a member of the scientific committee (Baud, 1994).

A Pangea meeting took place in Wuhan, Hubei, China, from March 9–11, 1999. The proceedings of the Conference with 14 papers (175 pages) were published as a University of Wuhan Special Publication. I chaired a session and gave a talk on our results with Viorel Atudorei on PTB in Oman (Baud et al., 1999).

Figure 11 : Group photo of the Guyang Permian Symposium, 1994.

B. Beauchamp organized the event in Calgary, Alberta, in August 1999 as part of the International Congress on Carboniferous and Permian Stratigraphy. Our research group contributed three abstracts to a special Pangea session on the Permian-Triassic transition (Baud, 1999 ; Beauchamp et al., 1999). At that time, I visited the Last Chance Saloon (Fig. 12).

Figure 12 : At the Last Chance Saloon, Bad Land, August 1999, Canada.

In 2001, the final Pangea meeting was held in Oman. With the coordination of research groups, I got the opportunity to include an Oman Pangea Symposium and field meetings in the International Conference on the Geology of Oman, organized by the Oman Ministry of Commerce and Industry. The 2-day Pangea Symposium started on January 14, in which 18 oral communications and 5 posters were presented. A field excursion was organized before the Conference and one four-day Post-Conference Excursion (Baud, Béchennec et al., 2001a, b). To prepare the three highly detailed field guidebooks, there were ten of us working together. The proceedings were published in a special issue of Palaeogeography, Palaeoclimatology, Palaeoecology (PPP -Baud et al., editors, 2003), and we wrote a Symposium report (Baud et al., 2001c) and participate at four papers (Baud & Beauchamp, 2003 ; Kozur et al., 2001a, b) and with Krystyn et al. (2003) a new line of research started (see chap. 3.9).

3.2 – The Peri-Tethys International Geological program 1993-1999

Following the "Tethys" international research program, a new International Geological program called Peri-Tethys was launched. At the same time, there was a new IGCP Project 343, "Correlation of epicratonic Tethyan basins".

We established an IGCP research group on the Permian-Triassic boundary crisis while working on the Peri-Tethys program with Jean Marcoux and Sylvie Crasquin. Financial funding was given to my proposal for field research and sampling in the Dobrogea region of Romania (Project Péritethys 95-32). I delivered a talk and oversaw a session during the second gathering, which was held in Bucharest in September 1993 (Baud, 1993). A collaborative study on the Lower Triassic of the Dobrogea that we published in 1997 has become a benchmark (Baud, editor, 1997 ; Baud et al., 1997).

A new collaboration started with Dr. Lucia Angiolini from Milano University who came to our Lausanne Geological Museum for Oman Permian brachiopod study collected by our post-doctoral student Alain Pillevuit. In January 1995, we were invited to participate in an international Peri-Tethys expedition that was carried out in the Sultanate of Oman for a better understanding of the stratigraphy, paleontology, sedimentology and paleoecology of the Permian succession of the Huqf area. During this expedition, a large collection of brachiopods were sampled along two stratigraphic sections at Saiwan and Wadi Haushi, studied and published by Lucia Angiolini with all our research team (Angiolini et al., 1995, 1997).

During the summer of 1996, a field campaign in the Ukrainian Crimean Peninsula was planned as part of the Peri-Tethys initiative. I traveled to Simferopol, Ukraine, with Jean Marcoux to conduct fieldwork on the Permian and Triassic blocs in Crimea under the direction of Professor Galina Kotlyar. After examination of the thin sections in Galina Kotlyar's laboratory (Fig. 13), our study led to the dating of the exotic blocks from this Ukrainian territory, their comparison with the exotic blocks from Kürée (northern Turkey) and the full publication of the results, issued in Kotlyar et al. (1999).

3.3 – Return to Canadian High Arctic Lower Triassic stratotypes, with new discoveries, 1994

Invited again by Benoit Beauchamp, I got the opportunity to work with Charles Henderson (Fig. 13). Together, we sampled for conodont studies the High Arctic localities with Otoceras on Axel Heiberg and Ellesmere Islands, to solve the controversy regarding the lower *Otoceas* zone correlation. The results were published in the Proceedings of the Beijing IGC 1996 (Henderson and Baud, 1997): overlying Changxing conodonts, the *parvus* conodont species appears in the middle of the upper *Otoceras* zone (*Otoceras boreale*).

Figure 13 : Invitation to Kotlyar's home after laboratory work with M. and G. Nestell in the ground, 1996.

Later, in 1999, Amalia Spina, a PhD student from Perrugia (Italy), received a UNESCO grant to conduct a palynological study of the Permian-Triassic arctic collection in our Lausanne Geological Museum. She then presented this new perspective on palynological evolution at the Permian-Triassic transition in the Sverdup basin along with S. Cirilli and our research team (Cirilli et al., 2001). In his analysis of the formation of Late Permian biogenic chert rocks in Arctic regions and with climatic change, Benoit Beauchamp linked me to his disappearance at the Permian-Triassic transition. Following presentation at Pangea Symposium 2001, we published it (Beauchamp & Baud, 2002), and this paper quickly got high citation index.

3.4 – Swiss National Foundation's projects on Triassic Carbon isotope studies, Research undertaken with Viorel Atudorei (1994-1999)

With the appointment of Zachary Sharp as new professor in Lausanne, a new C isotope laboratory came into operation and research programs could be submitted. To deepen the successful chemo-stratigraphic tool developed with Profs W. Holser and Magaritz, I proposed in 1993, a research project on Triassic C isotope studies at the Swiss National Foundations (SNF=FNRS) and got financial support in 1994 for Viorel Atudorei from Romania. With him, an important collection of Triassic rocks from the Dobrogea (Romania) was assembled and studied in detail in 1994, and also during the1995 Peri-Tethys field meeting (Fig. 14).

The Permian-Triassic transition on the N Indian margin of the Tethys was the subject of a C isotope analysis by Viorel Atudorei using the previously acquired materials from Kashmir and the Salt Ranges (Atudorei et al., 1995a, b ; Baud et al., 1995a, b, 1996).

Figure 14 : Peri-Tethys research Group in Dobrogea with Dr. S. Crasquin, 2nd from the left and V. Atudorei starting his PhD studies, 5th from the left, 1995.

The SNF financial support allowed us to continue field research and Permian-Triassic sampling in the Sultanate of Oman from 1996 to 1998 with the help of Jean Marcoux from Paris (Baud et al., 1999).

In 1997, Dr. H. Bucher provided Viorel Atudorei a collection of well dated Lower Triassic carbonate rock from Spiti (N India) and Viorel Atudorei was able to build the first complete Lower Triassic Carbone isotope curve, published in a Chapter of his PhD work. Viorel Atudorei brilliantly defends his thesis under my supervision (Atudorei, 1999). At the University of New Mexico in Albuquerque

(USA), where Prof. Z. Sharp accepted a new position and established a large isotope lab, Viorel Atudorei accepted a research position and launched a successful career there.

3.5 – Research undertaken with Sylvain Richoz (1999-2004)

The new FNSRS Project I submitted "La stratigraphie isotopique et l'étude de la matière organique des sédiments marins du Permien supérieur au Trias moyen", was approved, and Sylvain Richoz, a graduate geologist from Lausanne, was chosen to occupy the position of PhD assistant at the Geological Museum. In September 1999, Jean Marcoux, Sylvain Richoz and I traveled to start fieldwork in the Antalya region of SW Turkey. The three of us maintained these fieldwork efforts in SW Turkey from 2000 to 2003, expanding our study to the Alanya and Taurus region (Baud et al., 2001). We introduced Sylvain Richoz to Permian-Triassic fieldwork in Oman with Jean Marcoux in January 2000 (Baud et al., 2001 ; Richoz et al., 2001a, b).

In May 2002, as a result of Iran's opening to foreign researchers, our research team with Richoz had the chance to spend a month with the Geological Survey of Iran conducting field research and collecting samples from important Permian-Triassic sections in Central and NW Iran that have been published later (Richoz et al., 2010).

This allowed Sylvain Richoz to improve the chemiostratigraphy and the understanding of evolution of three Neo-Tethyan margins (Iran, Turkey and Oman) for the end of the Permian and the beginning of the Triassic and to write his doctoral study that he brilliantly completed and defended in 2004 and published in Richoz, 2006, highlighting the great instability of the inorganic carbon reservoir during the Lower Triassic.

3.6 – From chairman to past-chairman of the International Sub-commission on Triassic Stratigraphy (STS) 1993-2003

In June 1993, I participated in the fieldwork of the Anisian-Ladinian Boundary Working Group in the Italian Dolomites and in Hungary as chairman of the International Subcommission on Triassic Stratigraphy (STS). In November, I was invited to Heidelberg for the European Triassic Basins Study Group meeting.

In 1994, I led the plenary meeting of the STS organized during the "Shallow Tethys 4" Conference, Sept. 9-12, 1994, in Albrechtsberg near Vienna, Austria (Baud. 1994b). During this Conference, a Permian-Triassic Boundary Working-group (PTBWG) meeting and a regional IGCP project 359 meeting were also organized.

In 1995, Maurizio Gaetani was elected as new chairman. In 1996, the STS led a plenary meeting during the 30th International Geological Congress (IGC) in Beijing and the International Commission on Stratigraphy (ICS) approved Maurizio Gaetani as new SST chairman. As the person in charge of motivating the Boundary working group, M. Gaetani received a favorable vote in 1999 from the STS voting members regarding the selection of Meishan as the global Stratotype of the Permian-Triassic boundary (GSSP). In 2000, during the 31st IGC in Rio de Janeiro, the International Commission on Stratigraphy (ICS) ratified this GSSP and approved Mike Orchard from Vancouver (Canada) as STS new chairman.

In 2001, an Opening Ceremony of the GSSP Monument (Fig. 15) was organized in Meishan City during the International Symposium on "The Global Stratotype of the Permian-Triassic Boundary

and the Paleozoic-Mesozoic Events" led by Hongfu Yin. I gave a talk at the Symposium and the paper on Griesbachian substage redefinition was published in the proceedings (Baud & Beauchamp, 2003).

Figure 15 : The Ruban ceremony with C. Henderson in the middle and the author (right).

3.7 – Participation in International Geological Congress (IGC), Beijing (China) August 4-14, 1996, and Rio de Janeiro (Brazil) August 7 - September 3, 2000

Appointed by the IGCP Swiss Committee as head of the Swiss delegation to the International Union of Geological Sciences (IUGS), I took part in the work of the 30th International Geological Congress, a congress which was held in Beijing from August 4 to 14, 1996. I was in charge of one of the sessions of the Symposium on "the Permian-Triassic boundary and global Triassic correlation" and presented 2 communications (Baud, 1996 ; Baud et al., 1996). I followed the working sessions of the IUGS and participated in the plenary sessions of the Congress. As past chairman of the Triassic stratigraphy sub-commission, I actively participated in the general assembly of the sub-commission held within the framework of the Congress and went to a Permian- Triassic fieldtrip crossing West China (Fig. 16).

Figure 16 : Fieldtrip of the 30th IGC in Beijing, 1996, play with Chinese colleagues.

In 2000, I participated as a guest at the 31st International Geological Congress in Rio de Janeiro (Brazil) from August 7 - September 3. As guest speaker at the Permian-Triassic Symposium, I gave a talk on geochemical variations at the Permian-Triassic boundary (Baud, 2000). I followed Sessions and during the general assembly of the International Union of Geological Sciences (IUGS) held during the Congress, I was appointed chairman of IUGS Commission on Global Sedimentary Geology (C-GSG). After the Congress, I took part in an official excursion, a Geotraverse of the Andes between Mendoza (Argentina) and Vina del Mare (Chile). After the IGC tenure, my report on the accomplishment of the IUGS program GSG from 1987 to 2002 (Baud, 2002).

3.8 – From 1996, a second line of research started : our post-extinction microbial buildups

I discovered a new area of study within my thin section study of the Permo-Triassic collections I stored in the Geological Museum thanks to the IGCP Project 380, "Biosedimentology of Microbial Buildups", with its conference and workshop. Within my examination of the post extinction sediment from the following localities : Curuck Dagh (Turkey), Vedi (Fig. 17b) and Sovetchen (Armenia) and Abadeh (Iran), I received invaluable assistance from Simonetta Cirilli, Professor of Paleontology at the University of Perrugia (Fig. 17a). We presented a poster and abstract on "Biosedimentology of Microbial Buildups" in 1996 with her at the IGCP Project 380 meeting in Göttingen, Germany (Baud & Cirilli, 1996), and a publication we co-wrote with Jean Marcoux c both of which confirmed the idea that the Great Extinction resulted in the immediate resurgence of algo-bacterial buildups (Baud, Cirilli et al., 1997). This new concept was a landmark publication, followed by hundreds of others that fully confirmed it in all regions where the marine limestone layers of the Permian-Triassic transition outcrops.

Figure 17 : a) Simonetta Cirilli, b) The post-extinction Vedi Microbial Buildup in S. Armenia.

To understand the Neoproterozoic microbial early-life, and Paleozoic Mud-Mounds, I got the opportunity to participate in 3 field workshops :

1. From Nov. 30-Dec. 6, 1998, I participated in a fieldtrip to Atar (Mauritania). Janine Bertrand-Sarfati and Alexis Moussine-Pouchkine led a 6-day field workshop on the Mauritanian Adrar microbial buildups of the meso-neoproterozoic stromatolites and their environment. I had discussion with the world specialists of Neoproterozoic carbonate and took pictures of giant stromatolite columns (Fig. 18).

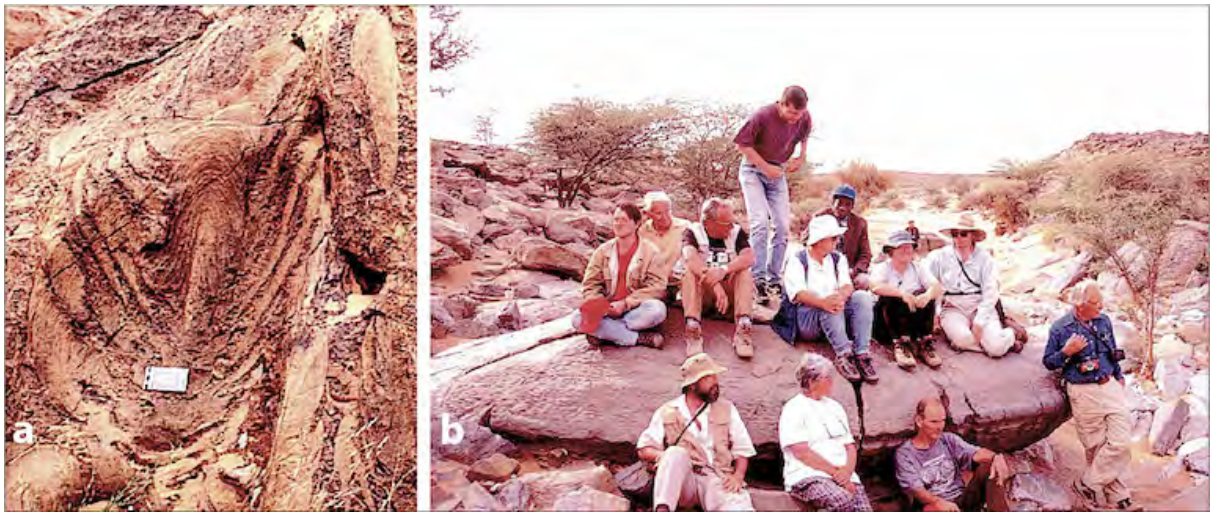

Figure 18 : Atar fieldtrip 1998, a) giant stromatolite columns, b) fieldtrip participants on a stromatolite bowl with J. Bertrand-Sarfati in the middle, down.

2. In 1999, The IGCP Project 380 organized a Fieldtrip to Ouarzazate (Morocco), Sept. 23-Oct. 2. The examinations of Devonian carbonate mound in the area of Ouarzazate were of great interest and the field guidebook became a reference.

3. The third field workshop in Namibia, 2002, was proposed as excursion before the 16th International Sedimentological Congress in Johannesburg (South Africa). Dedicated to the Cambrian Explosion Prelude : the Record of Life and Environments in the Terminal Proterozoic Nama Group, Namibia, in this fieldtrip, I was able to discover under the leadership of John Grotzinger, the best-exposed and most fossiliferous terminal Proterozoic sedimentary rocks along the west coast of Namibia.

With this microbial scientific background, the next field research periods were rich in new post-extinction microbial build-ups discoveries with renewed research teams.

3.9 – A third line of research started : metazoan's escape to the great extinction, a field discovery in Oman

Following the discovery of loose ammonoids, I collected close to a large boulder belonging to basal Triassic olistostrome of large Permian reefoidal blocks, during the Wadi Wasit geological survey with Jean Marcoux in 1997, Leopold Krystyn determined a Griesbachian age for these fossils and went in Late 1988, to sample the Wasit block (Fig. 19) on my precise geographical coordinates.

Figure 19 : L. Krystyn in front of the basal Triassic fossiliferous Wasit block, Oman.

In February 1999, I went back to start fieldworks and Jean Marcoux joined me to work and sample this boulder. With paleontological work done by Krystyn and the thin section's study at the Geological Museum on collected sample, we were able to recognize for the first time a basal Triassic limestone built by fossil accumulations in well oxygenated seawater.

At the 1999 Calgary meeting, I presented lectures on the Oman Permian-Triassic transition with references to it (Baud, 1999), and Krystyn presented a talk and a poster "A unique P/T boundary in the Tethys" with his detailed paleontological work at the Oman Pangea meeting (Krystyn et al., 2001) and the common results of our new research team (Krystyn et al., 2003), attracted a great

deal of attention and high citation index. Dr. Richard Twitchett from Plymouth University joined us (Twitchett et al, 2004).

3.10 – Permanent field education for student who applied to study the geology of Oman, 2002

We introduced the geological diversity of the Oman landscape to 13 master's students who were active participants with their structural geology professor, Henri Masson, in January 2002 as part of materials we prepared with Jean Marcoux and Sylvain Richoz for the Lausanne students in Geology association dubbed Pangea (. Dr Heinz Kozur (Hungary) joined the trip and published his own observations (Kozur, 2002).

3.11 – Museum exhibition before retirement in 2003 : an historical view on the last century's High Asia discovery

To end my active life before retirement on a high note, and on a subject that is close to my heart, I prepared with a small close-knit team (P. Forêt & S. Gorshenina), an historical exhibition on last century's High Asia discovery in our temporary exhibition building. It started with Victor Jacquemond (1801-1832) who was the first to discover fossils in Spiti-Himalaya. We gave also information on the geological explorers of the high Himalaya (F. Stoliczka and C. L. Griesbach) who first discovered the basal Triassic Otoceras fauna, and we ended with Arnold Heim and Augusto Gansser and his secret South Tibet geological exploration in 1936.

A highly illustrated book was edited in French at the Olizane edition. "La Haute Asie telle qu'ils l'ont vue. Explorateurs et scientifiques de 1820 à 1940", 152 pages and 120 illustrations (Baud et al., 2003).

To conclude this third period, I would first like to thank the Museum staff, preparators and secretaries who have helped and supported me, as also the laboratory staff, the librarians and thin section preparator of the Earth Science Department of Lausanne Science Faculty for their contributions.

The Lausanne Geological Museum, with its new Permian-Triassic collections and associated publications, has acquired an international reputation, which I was able to pass on to the Museum staff and to my successor on my retirement as director.

4 – The fourth period : end 2003-2010

My retirement as the head of the Geological Museum in Lausanne, and his time-consuming administration, opened a large new field research period, with my Permian-Triassic stratigraphy knowledge, my Carbon isotope chemiostratigraphy and my scientific background on microbial build ups. Without professional obligations, I had the time to write many previously unpublished observations and results from field work, to begin new studies on thin sections of rich Permian-Triassic collections, and to provide encouraging feedback to research teams conducting fieldwork in any open countries.

The Carbon isotope study continued with Sylvain Richoz, a new research line on microbialite with S. Cirilli, J. Marcoux and S. Richoz (Baud et al., 2003), and for the basal Triassic quick recovery research line. R. Twitchett followed our team with J. Marcoux and L. Krystyn. During this fourth

period, I was also able to share with colleagues and research teams all of my expertise in organizing field workshops and related symposiums.

Cooperation with paleontologist-stratigraphers continued with Jean Guex and Hugo Bucher on Triassic ammonoids, with Leopold Krystyn, Alda Nicora and from 2007 with Charles Henderson on conodont research. Since 2008, Sylvie Crasquin and Marie-Beatrice Forel have worked together on an ostracode study, and Lucia Angiolini has determined the brachiopods.

4.1 – Participation in International Geological Congress (IGC), Florence, August 18-29, 2004, and Paleontological Congress (IPC), Beijing, June 16-21, 2006

I attended the Field Symposium on Triassic Geochronology and Cyclostratigraphy in St. Christina (Dolomites, Italy) for the first time in September 2003, shortly after I retired from the Museum. During this conference, the Goldhammer's cyclostratigraphy theory received strong criticisms.

For the 2004 IGC, I traveled to Florence, Italy, with Sylvain Richoz's new post-PhD assistant to deliver his PhD research results on the C isotope chemiostratigraphy of Permian-Triassic transition sections from Iran, Turkey, and Oman (Richoz & Baud, 2004). I presented a talk in the late Permian-Early Triassic events session titled "A review of geochemical data on marine sediments of the Permian-Triassic boundary interval" (Baud & Richoz, 2004). During the congress, Bruce Wardlaw presented his Permian-Triassic database program called Chronos, a chronostratigraphic information system and he invited me to participate in the next Spring 2005, Permian-Triassic time-slice project Paleostrat meeting in Boise, USA (Fig. 20).

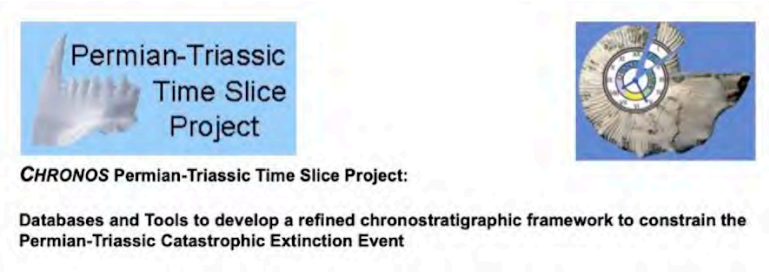

Figure 20 : Logo of the Permian-Triassic time-slice project.

I attended the Paleostrat workshop for the Permian-Triassic time-slice project in Boise, USA, May 1-2, 2005, as per my invitation. I gave two talks, one of which was about the huge Permian-Triassic specimens hosted at the Lausanne Geological Museum (Baud, 2004) and published on geochemical changes (Baud, 2005).

With Patrice Moix from Lausanne and Sylvie Crasquin from Paris, we went to the Second International Paleontological Congress in Beijing, June 16-21, 2006. I gave a talk (Baud et al., 2006) and was included in two other presentations with Botjer's team and Yin's team (Marenco et al., 2006 ; Yin et al., 2006, 2007a, b). From June 22-28, I took part in the field trip "Upper Paleozoic to Triassic successions of the Tibetan Himalayas and significant geological occurrences along the road leading to the Himalayas". During this fieldtrip, I organized the first sampling with Sylvie Crasquin and Patrice Moix of the lower Triassic Tulong section with his red ammonoid limestone (Fig. 21). This offered us the opportunity to be included in the 2009 and 2011 published papers on the Tibetan Tulong section (Brühwiler et al., 2009 ; Forel et al., 2011).

Figure 21 : Sylvie Crasquin at the lower Triassic Tulong red ammonoid limestone section, Tibet Himalaya.

4.2 – Continuing collaboration in Oman with Jean Marcoux, 2003-2007

As in the past, Françoise and Jean-Paul Breton, who reside in Ruwi/Muscat, provided invaluable assistance, friendship and gave to our research group a home on our arrival in Oman. Dr. Hilal bin Mohammed Al-Azri, Director General of Minerals up to 2005, continued to listen positively to our research programs in Oman.

In preparation for the 2005 field trip, we began fieldwork with Jean Marcoux and Hugo Bucher in the Nizwa region of Oman in January 2004. We later joined our colleagues L. Krystyn from Wien and R. Twitchett from Plymouth who were traveling from the Emirate side to work and collect samples in the Wadi Maqam region (Fig 22).

Figure 22 : Start of field work 2004 in Wadi Maqam (Oman) with L. Krystyn, left, J. Marcoux and R. Twitchett.

Our study team presented three papers at the 24th International Association of Sedimentologists (IAS) meeting, which took place from January 10–13, 2005, at Sultan Qaboos University at Al Khod in the capital city area of Muscat, Oman.

To develop the field guidebook on "Mesozoic evolution of the Tethyan margin of Oman", my colleagues H. Droste, C. Robin, F. Guillocheau, P. Razin, and F. Bechennec collaborated with me (Baud et al., 2005). We held this field workshop from January 4 to 9. Together with S. Richoz, L. Krytyn, J. Marcoux, and R. Twitchett, we wrote the field trip "Birth and Early development of the Tethyan Oman Margin from Middle Permian to Middle Triassic : a geochemical and sedimentological approach" and successfully led the excursion from January 14 to 17 (Richoz et al., 2005).

4.3 – Continued collaboration in Turkey with Jean Marcoux, until his death in 2008, and visit to Spiti/Himalaya (2004) and to New Zealand (2006)

Up until 2007, Marcoux's connection at Isparta University in Turkey greatly aided us in obtaining a field study and sampling permit. Just a week after retirement, in Sept. 2003, I was invited to field research on Permian-Triassic succession of Hazro, in SE Turkey, by Marcoux's research team. We sampled a complete Permian section, and the foraminiferal content were published later (Gaillot & Vachard, 2007 ; Gaillot et al., 2016). With Sylvie Crasquin, we studied the Permian-Triassic transition (Baud et al., 2016).

In June 25 to July 10, 2004, with friends, J. Marcoux and our wifes, we reached the Field workshop of the IGCP Project 467 on Triassic Time–in the Himalayan Spiti Province of N India and had opportunity to study and sample the key section on the Permian-Triassic boundary with the *Otoceras* beds.

In May 2005, we went back to SW Turkey for field work with J. Marcoux on Permian paleotectonic of the Curuck Dagh area. We discovered large intra-Permian-Triassic displacements and unconformities, as well as ikaite pseudomorphs' on middle Permian limestone for the first time (Baud et al., 2005),

Along with J. Marcoux and our wifes, we made the decision to travel to New Zealand in March 2006 for a field workshop of the IGCP 467 on the Permian-Triassic radiolarite deposits on the North Island as well as to the InterRad 11 & Triassic Stratigraphy Symposium meeting in Wellington, where we gave two talks (Baud et al., 2006 ; Marcoux et al., 2006). The fieldtrip offered the unique opportunity to observe the world's only section of continuous Late Permian to middle Triassic radiolarite on Arrow Rock Island (Fig. 23).

When I looked at the outcrops beneath the Late Permian radiolarites, I found a pillow-lava basement that was coated in red ammonoid limestone, which served as the foundation for my upcoming research path (Chap. 5.11).

In Sept. 2007, Patrice Moix, a PhD student from Lausanne, asked Marcoux and I to have a look at his PhD fieldwork in an area near Mersin, S Turkey. Thereafter, we went to Alanya area and discovered a new PTB section at Oznurtepe. It was my last fieldwork with him.

In May 2008, due to Marcoux's illness, we carried on the fieldwork with Sylvie Crasquin, her PhD student M.B. Forel, and a newcomer named Steve Kershaw who was interested in microbialite and published it (Kershaw et al., 2011, 2012). I coached L. Angiolini's PhD student, V. Verna, on Permian brachiopod sampling in Curuck Dagh area, SW Turkey, alongside Prof. Alda Nicora (Verna et al., 2011). All our team also prepared an IGCP 572 field workshop in Antalya for 2009.

Figure 23 : InterRad participants looking at the world's only lower Triassic radiolarian chert on Arrow Rock Island, New Zealand, 2006, with H. Kozur sitting in the back.

We had just returned from conducting fieldwork in Jean's favorite area of study—the Antalya Mountains of South Turkey—when we learned of his sudden death on June 17, 2008. We were all deeply saddened to learn of that. Some of us participated in his burial ceremony in the famous Père Lachaise cemetery in Paris. Having spent over 25 years of geological adventures with him, writing together, organizing meetings or geological expeditions, I immediately started to write tribute papers in our Permian and Triassic newsletters and in introductions of our field guidebooks on Turkey and Oman (Baud, 2008, 2009 a, b, 2010).

4.4 – IGCP's new project 572 will pay tribute to Jean Marcoux at two conferences we've organized on the fields he covered so much.

Under the leadership of Zhong Qiang Chen (Australie) the aim of the IGCP Project 572 was to investigate the recovery of ecosystems following the end-Permian mass extinction through analyses of the rock and fossil records via studies of biostratigraphy, paleontology, paleoecology, sedimentology, geochemistry and biogeochemistry.

The Second IGCP 572 Annual field workshop took place in Antalya, Southern Turkey, from September 2nd to September 6th, 2009. As a co-organizer, I oversaw the opening session dedicated to Jean Marcoux's memory and reminiscing about his extensive scientific career and contributions to our understanding of the Permian and Triassic periods. The assistant professor E. Kosun has helped organized a one-day meeting for September 3 at the Engineering Faculty Akdeniz University in Antalya. In my speech, I went over each stop on the 3-day field workshop that S. Crasquin and S. Kershaw and I had planned for September 4-6 (Crasquin et al., 2009).

The Third IGCP 572 : Annual field workshop took place in Oman from February 20–26, 2010. The meeting, led by Professor Michaela Bernecker, lasted one and a half days at GUtech in Muscat and a talk pay tribute to Jean Marcoux Oman's fieldworks.

The four and a half-day field workshop excursion, led by O. Weidlich, A. Baud, B. Beauchamp, L. Krystyn, A. Nicora, C. Henderson, S. Richoz, F. Cordey, and R. Twitchett, gave participants the chance to see the stunning outcrops of the Oman Mountains (Fig. 24), which offer unmatched access to the Permian-Triassic transition units along the Gondwana margin of the Tethys (Baud, & Bernecker, editors, 2010).

Figure 24 : Group photo of the IGCP 572 annual field workshop participants on the Saiq Plateau, 2000 m. high, Oman.

4.5 – Continued collaboration with Benoit Beauchamp, Charles Henderson and Steve Grasby, 2003-2010

In 2003, the Pangea Special Issue edited by B. Beauchamp was issued. I participated in the I.C.E. 2004 CSPG joint conference in Calgary, Canada, and the Beauchamp research team used two of my contributions in papers that were presented there (Beauchamp et al., 2004a, b).

B. Beauchamp asked me to speak to his students at Calgary University in 2005, and I accepted the invitation. On my recommendation, the research on the Permo-Triassic in Oman was continuously carried out in partnership with Benoit Beauchamp, Charles Henderson, and Steve Grasby, and they received financial support for it. As a result, the Beauchamp research team along with Noel James from Kingston (Canada) and Alda Nicora from Milano traveled to various important Permian-Triassic outcrops (Fig. 25), from Central Oman to Wadi Maqam near the Emirates border in January 2006 for fieldwork.

Figure 25 : The Beauchamp research team with A. Nicora in the middle, collecting Permian red ammonoid limestone in Rustak (N Oman).

I participated in the Boreal Triassic Conference at Longyearbyen, Svalbard, Arctic Norway in August 2006, and give a talk on the lower Triassic bryozoan beds I discovered on Ellesmere Island during the 1994 field work with B. Beauchamp. The research report by the Beauchamp research group in collaboration with the bryozoan expert Prof. Hans Nakrem from Oslo was published in Polar Research (Baud et al., 2007).

We traveled with B. Beauchamp to many significant Permian-Triassic outcrops in Oman in January 2009 to prepare for the second IGCP 572 field workshop, Sultanate of Oman, scheduled for 2010. In September 2009, following the IGCP 572 field workshop, in Antalya, I led Charles Henderson to discover some Permian-Triassic outcrops not included in the workshop.

The second IGCP 572 field session was actively attended by the Beauchamp research team in the Sultanate of Oman in 2010.

4.6 – New collaboration with Prof. Dave Botjer from UCLA, his doctoral students Sara Pruss, Pedro Marenco, Dr. Frank Corsetti and Dr. Adam Wood, (Los Angeles, Ca, USA), 2003-2008

I asked in 2003, Sara Pruss and Dave Botjer to explore with me the Permian-Triassic units of the Antalya Mountains in southern Turkey. They collected samples and enthusiastically encouraged me to join them in a 2004 study of the US West Coast Triassic.

F. Marenco examined S isotope of the samples, after which he sent a common abstract for the 2004 GSA annual meeting. In May 2004, I joined the UCLA Permian-Triassic team for a field workshop on Nevada-California lower Triassic outcrops and went to Darwin Hills lower Triassic limestone (Marenco et al., 2004).

In March 2005, I joined Sara Pruss for field work on the Triassic of the Darwin Hills and in Muddy Mountains close to Las Vegas.

I attended the International Symposium on Triassic Chronostratigraphy and Biotic Recovery in Chaohu, China (Fig. 26), from May 23–25, 2005, together with Sylvain Richoz new post-PhD assistant. We met the D. Botjer research group at the symposium, where I presented a talk on the lower Triassic anachronistic carbonate facies in space and time, along with S. Richoz and S. Pruss. The talk was published in Baud et al., 2007. Marenco and Corsetti team presented the S isotope anomalies across the PTB (Marenco et al., 2005).

Figure 26 : Group photo of the participants to the Chaohu meeting, 2005, D. Botjer and I are second in the right front.

The same year, D. Botjer was in charge of a C.R. Palevol special volume on "The Triassic recovery, the dawn of the modern biota" and we had the opportunity to publish one paper with Marcoux and Richoz on Turkey basal Triassic calcimicrobial cap rock (Baud et al., 2005), and one with the Corsetti and Marenco team in association with Richoz on "Summary of C isotope records" (Corsettti et al., 2005).

In 2006, S. Pruss, D. Botjer, and I collaborated on a paper for Earth Science Review that compared the post-extinction responses of S Turkey and W USA from fieldwork conducted in Turkey and the USA in 2003 and 2005 (Pruss et al., 2006).

In 2008, S. Pruss and I traveled to Bolzano for the Workshop on Triassic Paleoclimatology, where we spoke and looked for opportunities to conduct fieldwork in the S Alps Middle Triassic near Bagolino (Pruss, & Baud, 2008).

In January 2005, as Dr. Adam Wood attended the IAS meeting in Muscat, Oman, I urged him to begin field investigation and sampling on the lower Triassic red ammonoid limestone of the Baid outcrop (Fig. 27). He invited me to present "Unusual Lower Triassic Seafloor Precipitates from Oman" at the GSA annual meeting 2006 in Philadelphia, USA (Woods & Baud, 2006), following my successful research on this limestone. In 2008, our article on "Anachronistic facies from a drowned Lower Triassic carbonate platform of the Oman Mountains" was published (Woods & Baud, 2008). With Sylvain Richoz we developed this research in 2013 (Chap. 5.5) .

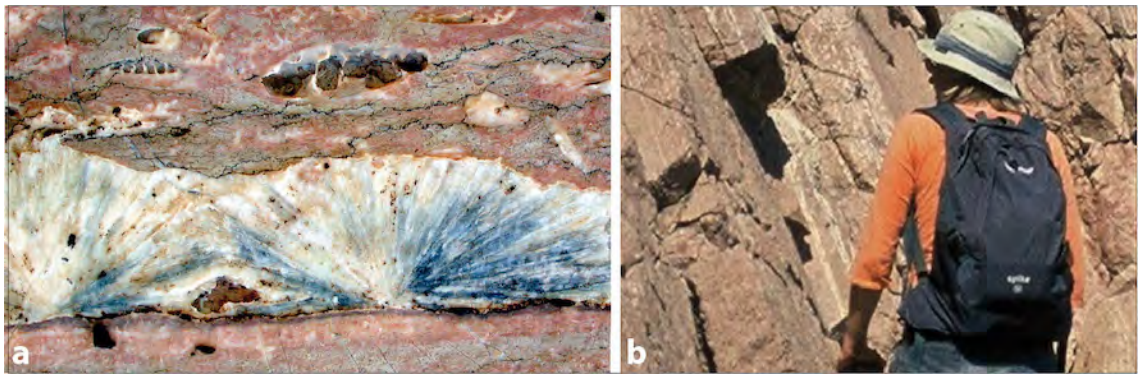

Figure 27 : The Olenekian red ammonoid limestone of Baid, Oman, a) Unusual Lower Triassic seafloor precipitates overlain by ammonoid, b) Adam Wood examining the outcrop.

4.7 – Geological consultant, 2005-2008

In response to the need for scientific knowledge in my area of expertise, I created the position of Geological consultant, named BGC, during my retirement at the request of my friend and colleague Jean Paul Breton, who oversees an Exploration Consultants office in Muscat, Oman (Fig. 28). I had the responsibility of providing J.P. Breton, with expertise on the Permian breccias of the Jebel Akhdar for the purpose of exploiting colored marble in May 2005.

In March 2007, I was asked to provide a guidebook and to lead a 3-day field excursion for Total SA geological experts, on the Permian-Triassic carbonate succession of the Saiq Plateau in Oman (Baud, 2007).

At least, I worked with J.P. Breton on the Triassic breccia of the Wasa Mountains South of Wadi Maqam in northwest Oman in January 2008.

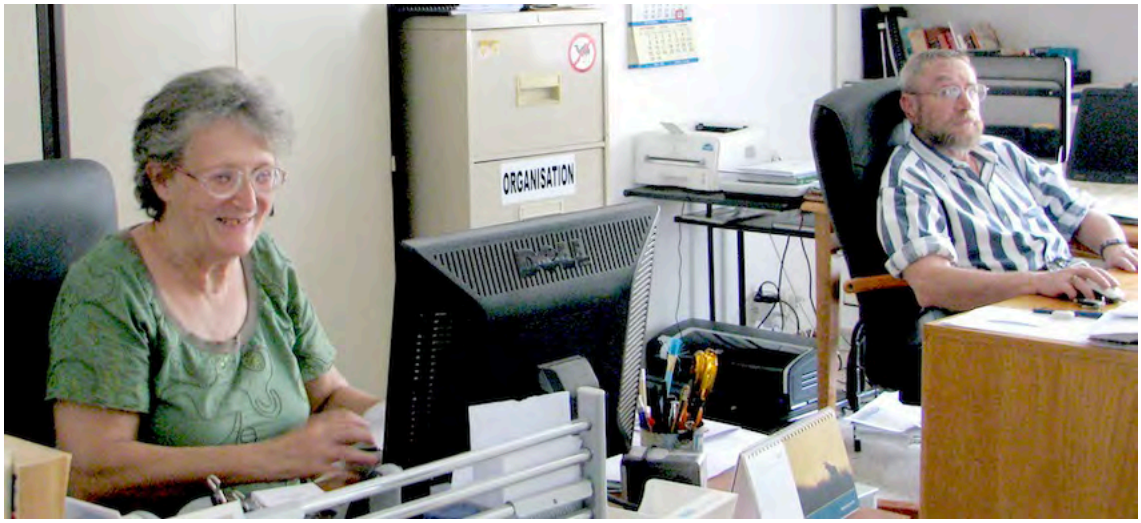

Figure 28 : The Exploration Consultants office in Muscat, with Françoise and Jean-Paul Breton.

4.8 – Start of continuing geological education for French high school teachers (CBGA)

In 2009, I was approached by Thierry Juteau, a honorary professor of geology from Brest University and an expert in ophiolite rocks, to co-lead a geological expedition in the Oman Mountains and co-write a field handbook. Thierry Juteau is also the supervisor of the continuing geological education program for French high school teachers (Juteau et al., 2009). I went on the trip towards the end of October 2009 with some friends and I was involved in presenting the best outcrops for understanding the geology of Oman and teaching it to high school students. The continuation of this involvement is presented in chapter 5.12.

5 – The fifth period : 2011-2023

Cooperation with paleontologist-stratigraphers continued with Profs Jean Guex, Hugo Bucher, and Dr. Thomas Brühwiler on Triassic ammonoids, with Profs Nicolas Goudemand, and the PhD students Morgane Brosse and Marc Leu newcomers to lower Triassic conodont of South China, Kashmir and Oman. My research on conodonts with Francis Hirsch and Pablo Placensia gave me a fresh perspective on the middle Triassic strata of the Swiss Prealps.

Applying earlier research avenues to new field study areas enables discoveries and opens up new avenues. Opportunity came to help organize international field workshops due to openminded local colleagues who welcomed the UNESCO IGCP projects.

The permanent geological education programs continued with the French high school teachers and were expanded to include Lausanne PhD students.

5.1 – Fieldwork in Oman, the Austrian research team with Sylvain Richoz, Leopold Kystyn and Rainer Brandner, and the Canadian research team with Benoit Beauchamp, Steve Grasby and Charles Henderson

In January 2011, just one year after the IGCP 572 workshop, we started field work with L. Krystyn in the Batain (Oman) and J. Guex joined us and when I discovered the fossiliferous Asselah block,

looking at the silicified ammonoid on the surface, both specialists agreed on the Griesbachian, basal Triassic age of this block. As they showed no interest in studying it, I began talking about what we did in the ensuing years with H. Bucher in Zurich, who was prepared to embark on a new research project with PhD students.

Along with S. Richoz, I attended the EAG Permian-Triassic conference in Kuwait City in December 2011. We presented two talks and a report on the 2010 IGCP field workshop in Oman (Baud et al., 2011 ; Richoz et al., 2011).

In 2012, I went with S. Richoz to the International Conference on the Geology of the Arabian Plate and the Oman Mountains from 7-9th January 2012, at Sultan Qaboos University, Muscat, (Fig. 29) and we gave 2 talks and published our results in collaboration with the Canadian team (Baud et al., 2012a, b ; Richoz et al., 2012a, b).

Figure 29 : Group photo of part of the participants of the Conference in front of the Sultan's Palace.

The 2013 research by S. Richoz is showcased in the emerging field of study on the link between microbial buildups and post-extinction metazoan sponges, see chapter 5.7.

In 2015, B. Beauchamp came back to Oman, for field work and I went with him on the Saiq Plateau and in the Batain plain to deepen our study on the Permian limestone succession.

At the 31st IAS Meeting of Sedimentology, which took place in Krakow, Poland, from June 22–25, 2015, some of our findings were presented (Beauchamp et al., 2015), and in 2018 in Quebec City, Canada, during the International Sedimentological Congress (Beauchamp & Baud, 2018).

5.2 – From 2011, field work in Oman with Prof. Hugo Bucher and his PhD students from Zurich University and Museum

The new partnership with Hugo Bucher and his PhD students began in 2018 and continues to this day inside the study group on Permian-Triassic transitions at Paleo C4 - Sinergia Swiss University research group.

Each year's field work in Oman, got the discrete help of Professor Michaela Bernecker living and working on-site in Muscat, for stewardship and preparation of fieldworks tools. It was with her and Oliver Weidlich, that we organized the excursions to the "12th International Symposium on Fossil Cnidaria and Porifera" held in GuTech in 2015 (Baud & Weidlich 2015).

We started field work in November 2011, to study the Asselah block in the Batain, with Asa Frisk PhD student and Dr Nicolas Goudemand, and to sample this new basal Triassic fossiliferous block, just 10 months after my discovery with L. Krystyn and J. Guex (Baud et al., 2015 ; Brosse et al., 2019).

We traveled in December 2012 with Hugo Bucher as part of the project "The Permian mass extinction and Early Triassic recovery of Eastern Oman" to explore the Batain and Wadi Wasit areas. In December 2013 and January 2015, we returned to Batain research with a PhD student named Romain Jattiot. In January 2017, Marc Leu, a PhD student joined us to study the red ammonoid limestone of Wadi Musjah (Baud, 2013a) and new lower Triassic blocks in the Batain. Same year in December, we went to Djebel Rabat area and in January 2018, we achieved the sampling of the lower Triassic fossiliferous boulders and buildups of the Batain with H. Bucher and T. Brühwiler.

From 2018, Oman samples stored in the Geological Museum of the Zurich University have been under study by teams of Professors and PhD students from Lausanne and Zurich for paleontological determination and geochemical study with funding from the Synergia FNSRS program. The main results have been presented at Geological Conferences and published in papers and in PhD thesis chapters of Morgane Brosse (Brosse et al., 2017), Marc Leu (Leu et al., 2021, 2023), Zoneibe Luz (Luz et al., 2023), Franziska Blattmann (Blattmann et al., 2023) and Oluwasser Edward (Edward et al., 2023).

5.3 – The Geological Society of Oman (GSO) : Collaboration continues, 2011-2015

During my stay in Muscat, my proposals to give a talk or to lead a fieldtrip on the Permian or Triassic was always welcome. This is the reason I offered to take the Society members to the Buda'yah section in January 2011 (Fig 30).

Figure 30 : a) Geological explanations in the field, b) The author with Dr. Mohammed Alkindi, Chairman of the GSO.

This is the only location where middle Permian radiolarite is directly lying on pillow lava substratum. It was suggested that this location be included in Oman's geological heritage because it provides a unique record of the oceanic environments of the Neotethys from the Middle Permian to the Early Triassic (Baud, 2011).

The Khuff Margin in the Oman Mountains has been the focus of my conference in November 2013. In February 2015, I gave a talk on Oman oases : contrasting carbonates sediments on the Gondwana margin in the immediate aftermath of the Permian-Triassic (from Baud et al., 2014).

5.4 – Field work in the Guangxi S China and in Kashmir NW India with Prof. Hugo Bucher and his PhD students from Zurich University and Museum

Among my fieldwork locations, the Guangxi province in southern China was unfamiliar to me. I was touched by the warm welcome I received from Kuang Guodun, a retired geologist from the Guangxi Bureau of Geology, who led Bucher's research team in important Permian-Triassic outcrops in his area of expertise.

We started field work in March 2011 with H. Bucher, PhD student Åsa Frisk and Kuang Guodun, visited and sampled about 15 Permian-Triassic boundary (PTB) and Lower Triassic sections in north Guangxi province. The next field works were in February 2012 with the same team and a newcomer, Morgane Brosse, a PhD student and we extended our research to the whole Guangxi province and sampled almost 15 PTB sections (Brosse et al., 2013, 2015, 2016 ; Bagherpour et al., 2015, 2016, 2017 ; Hautmann et al., 2015).

One of them, the Shangan section opened a new line of research which will be presented in chapter 5.5.

The opening of the Indian Kashmir in 2012, after 25 years blackout, offered me the opportunity to coach PhD students with the precious help of Professor Ghulam Bhat from University of Jammu, India. In May 2012, I led a group of PhD students, including Dr. Nicolas Goudemand, Marc Leu, Max Meier, and Morgane Brosse, to the Guryul Ravine area where we conducted research on the Permian-Triassic boundary and the lower Triassic succession (Brosse et al., 2013, 2017). We were accompanied by G. Bath. Additionally, we conducted several local surveys looking for fresh PTB sections (Fig 31).

Figure 31 : Our 2012 research team in Kashmir with Kashmiri colleagues and Prof. Ghulam Bhat second from left.

Under the guidance of G. Bath, our small team returned in October 2013 to complete the lower Triassic Guryul Ravine study. Some results were presented at the 19th International Sedimentological Congress 2014, (Leu et al., 2014), and our team with H. Bucher published 2 papers (Brosse et al., 2017 ; Leu et al., 2023). The main common results are in the PhD thesis of Dr Morgane Brosse (2017) and of Dr Marc Leu (2021).

5.5 – A new line of research : The post-extinction metazoan sponge link to the stromatactis bearing limestone, 2011-2015

When Bucher's research team and I discovered a post-extinction basal Triassic stromatactis limestone in the Dongpan area of southern China in 2011, I became aware of the significance of sponges since we knew that stromatactis originated from sponge collapse in carbonate-forming rock. For this reason, in addition to giving a talk and writing an abstract for the IGCP 572 closing meeting in Egger, Hungary, (Baud et al., 2012a), I also attended the 29th IAS Meeting of Sedimentology in Schladming, Austria, (Baud et al., 2012b), the GSA Annual Meeting in Charlotte, Charlotte USA (Baud et al., 2012c), and the World Summit on P-Tr mass extinction & extreme climate change in Wuhan, China, in 2013 (Baud et al., 2013).

Working with S. Richoz on the Olenekian Baid red limestone of Oman in 2013, we examined the thin sections once more (see chap. 4.6). We also sent an abstract titled "The Smithian (Early Triassic) red ammonoid limestone of Oman, refuge for sponge–microbial build-ups during a recovery phase" (Baud & Richoz, 2013) and presented our findings at the 12th International Symposium on Fossil Cnidaria and Porifera, which took place at GuTech, Muscat, Oman, (Baud & Richoz, 2015).

5.6 – Fieldwork in Iran and in Turkey with Sylvain Richoz and the Austrian research team : Leopold Krystyn, Rainer Brandner and newcomers, Micha Horacek, Katrin Heindel and Paul Beckman

Thanks to Dr. Taipeh Mohat, Chief Geologist at the Iran Geological Survey, who extended the invitation and oversaw our research team in the field, we were able to accept the invitation to return to Iran in 2011. With the Austrian research team, we received 2 weeks financial support and opportunity to study five Permian-Triassic boundary sections in Zagros and in Central Iran, from May 16th to 30th 2011 (Heindel et al., 2013, 2015, 2016, 2017, 2018a). As detailed in Chapters 5.7 and 5.8, these fieldwork activities with our research team enabled us to expand my observations on the geometry and spatial distribution of the microbial buildups, in the important Shareza and Abadeh areas.

In Turkey, Dr. Erdal Kosum of Antalya University assisted us and actively participated in our Permian-Triassic fieldwork in the Antalya and Alanya region (Fig. 32) in April 2012 (Heindel et al., 2018b).

5.7 – Fieldwork in Armenia with Sylvain Richoz, the Austrian research team and Evelyn Friesenbichler, PhD student participated in the published papers

Thirty years after my first geological visit, I received an invitation to return to Armenia, thanks to Professor Lilit Sahakyan, who guided us in the field, helped organized our field research, and welcomed us in Erevan. The Armenian Academy of Science invited the Austrian research team, consisting of

Sylvain Richoz, Leopold Krystyn, Rainer Brandner, and PhD student Evelyn Friesenbichler, to begin Permian-Triassic study in Armenia in 2014. We spent ten days, from September 27 to October 7, 2014, to study important Permian–Triassic sections.

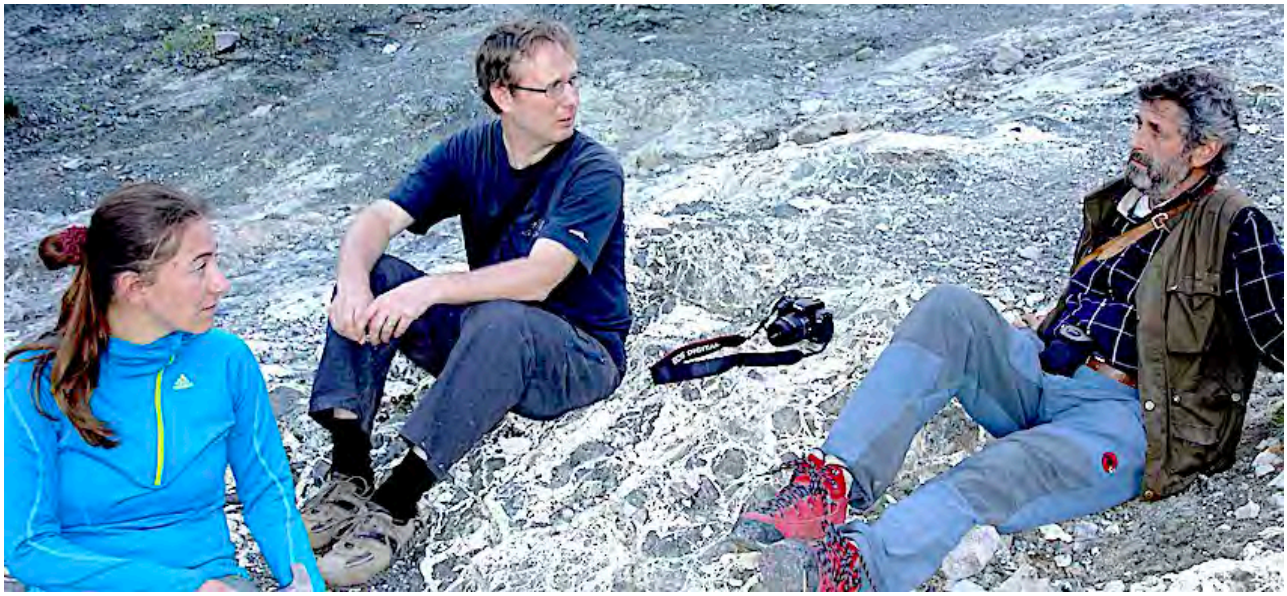

Figure 32 : Field work near Alanya, discussion between K- Heindel, left, S. Richoz and R. Brandner.

Thanks to our collaboration and my prior field experience, we were able to expand our new line of research, which I described in Chapter 5.8, by gaining a deeper understanding of the complexity of post-extinction buildups and the role of sponges.

Together with our Armenia PT Geology research team, we submitted an abstract and presented a talk titled "Giant microbial buildups of earliest Triassic in Armenia" at the Goldschmidt Conference in Prague, Czechia (Baud et al., 2015); the 2nd International Congress on Stratigraphy, July 19–23, Graz, Austria (Friesenbichler et al., 2015); and the 2016 GSA Annual Meeting, Denver, Colorado, USA (Friesenbichler et al., 2016). During the Armenia IGCP 630 field workshop in Erevan, we presented our results in an abstract and on the detailed field guidebook presented in Chapter 5.10.

5.8 – An extended line of research : The post-extinction metazoan sponge link to the microbial buildups, 2016-2021

With Katrin Heindel, we sent an abstract and presented a talk on "Earliest sponge-microbialite reefs on Neotethys platform margins in the Early Triassic" at the Dolomieu Conference on Carbonate Platforms and Dolomite, Selva di Val Gardena (Italy), and at the 2017 GSA Annual Meeting in Seattle, Washington, USA and at the 5th IPC, Paris July 5-9, 2018 (Heindel et al., 2018b).

As part of Evelyn Friesenbichler's PhD student thesis work (Fig. 33) and in collaboration with William Foster, a recent addition to our Austrian-Armenian research team. "Sponge-microbial build-ups from the lowermost Triassic Chanakhchi section in southern Armenia" was submitted and published (Friesenbichler et al., 2018). A next paper, "The formation of microbial-metazoan bioherms and biostromes following the latest Permian mass extinction", was submitted and published (Foster et al., 2018).

Figure 33 : a) part of the build-ups from the lowermost Triassic Chanakhchi section in southern Armenia, b) Evelyn Friesenbichler on this section of her PhD.

During the International Sedimentological Congress in Quebec City, Canada, August 12–17, 2018, I presented an abstract and a talk that expanded our discovery of the earliest Triassic sponge-microbialite reefs in Armenia to our basal Triassic succession of microbialites in Central Iran (Baud et al., 2018). Another new perspective of the basal Triassic sponge-microbial buildup as a time specific facies on the Central Iran and Armenia Cimmerian margin was proposed with S Richoz and in 2019, we sent an abstract and gave a talk at the 3rd International Congress on Stratigraphy, Milano, 2-5 July 2019 (Baud & Richoz, 2019).

I completed our collaborative article on "Sponge takeover from End-Permian mass extinction to early Induan time : Records in Central Iran microbial buildups" in 2020 with Micha Horacek as a newcomer. It was published in Baud et al. (2021).

5.9 – Stratigraphic readjustment of the Swiss Prealps middle Triassic carbonate succession, a collaboration with Francis Hirsch, Pablo Plasencia and Sylvain Richoz

As the stratigraphy and paleontology of the Triassic conodont have progressed, and in light of the favorable collected rocks found in the *Costatoria goldfussi* limestone, which is situated 650 meters above the sequence base at the Wiriehorn and Rothorn localities in the Swiss Prealps, I made the decision to gather residues following the dissolution of the limestone. Dr Heinz Kozur invited in 2002 by the Geological Institute looked at it and apparently recognized the species *truempyi*, but never confirmed it. The extract conodonts were handled by PhD candidate Sylvain Richoz, and it wasn't until 2009 that I got in touch with Dr. Francis Hirsch, who had moved to Japan. Having recently completed research on conodonts identical to his own, he wrote to Dr. Pablo Plasencia in Spain, expressing his keen interest (Plasencia et al, 2016, 2018). With the help of F. Hirsch, P. Plasencia was able to verify the identification of *Sephardiella truempyi* (HIRSCH) and the brief existence of this confirmed species at the base of the Ladinian stage when he visited Lausanne to examine the recovered material.

That's the reason I began working with them to revise my 1984 stratigraphy of the Swiss Prealps' middle Triassic succession, which we successfully published with fresh insights into the entirety of the Briançonnais' middle Triassic in the Western Alps, as well as the Early Ladinian marine transgression over part of Western Europe (Baud et al., 2016).

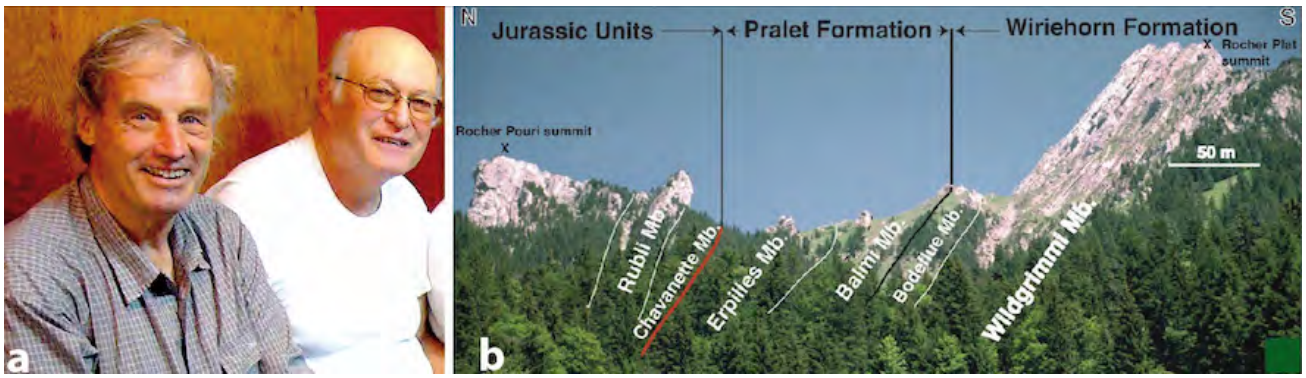

Figure 34 : a) Francis Hirsch, right, and the author, b) View on the type locality (stratotype) of the Pralet Formation, Ladinian, Swiss Prealps.

5.10 – IGCP 630 field workshops : Kashmir, Armenia and China, 2014-2018

My involvement in IGCP project continued with the IGCP Project 630 and his leader, Prof. Zhong Kiang Chen of the Wuhan University of Geosciences (China). I took the opportunity to suggest a field workshop with Professor Ghulam Bhat, and we invited Professor Zhong Kiang Chen Chen, to collaborate with us in organizing the first IGCP 630 workshop in Kashmir, which we agreed to take place in November 2014. I coordinated the field workshop with G. Bhat and wrote the field guidebook based on my previous data (Baud et al., 2014a), and the report (Baud et al., 2014b).

I suggested to Prof. Lilit Sahakyan that she welcome a field workshop in Armenia, much as I did with Prof. Ghulam Bhat. We asked Prof, Zhong Kiang Chen, leader of IGCP 630 project, to organize it with us. This second IGCP 630 workshop was held from October 7-15, 2017, with 2 days talks in Erevan under the leadership of Lilit Sahakyan, followed by 6 days in the field (Fig. 35). I gave a talk and we presented our final results in an abstract (Baud et al., 2017), on the field guidebook (Sahakyan et al., 2017a) and on report (Sahakyan et al., 2017b).

Figure 35 : Group photo of the IGCP 630 field workshop participants on the Zangakatun section of S Armenia, 2017.

The closing meeting of IGCP 630, was held from May 22-24, 2018, in Wuhan, China. Following my presentations on the outcomes and perspectives from the previous ten years of IGCP 630 and 572 field meetings (Baud, 2018), L. Sahakyan included me in her presentation on the 2017 Armenian field conference (Sahakyan & Baud, 2018). I received a IGCP Honorary Award. The journal article I authored regarding these final results was published in Baud et al. (2018).

5.11 – The time specific facies of Middle Permian, of Latest Permian and of Early Triassic red ammonoid limestone, from New Zealand, Timor, Himalaya to Iran, Armenia and Oman open a new line of ongoing research.

Through our field research, we have accumulated data on red ammonoid limestones and have had the opportunity to present some data on those from Middle Permian (Guadalupian) in Baud et al. (1993) and in Marcoux & Baud, (1996). About Timor some data are in Baud & Marcoux, (1991), and about Oman in Pillevuit et al. (1997), Baud et al. (2001b), Kozur et al. (2001a, 2001b) and Richoz et al. (2013).

Late Permian red ammonoid limestone facies have been illustrated in Armenia in Sahakian et al. (2017) and both Armenia and Iran by Baud & Richoz, (2019).

The Lower Triassic facies, which includes the red ammonoid limestones described in Oman, the Himalayas and Timor (Fig. 36), were presented by the author at the First Joint Scientific Meeting of GSC and GSA in Chengdu (Baud, 2013a).

An approach to these facies specific to certain time periods (Middle Permian, Late Permian and Olenekian) was presented in Beijing by Baud & Bucher (2019) and work is in progress for publication.

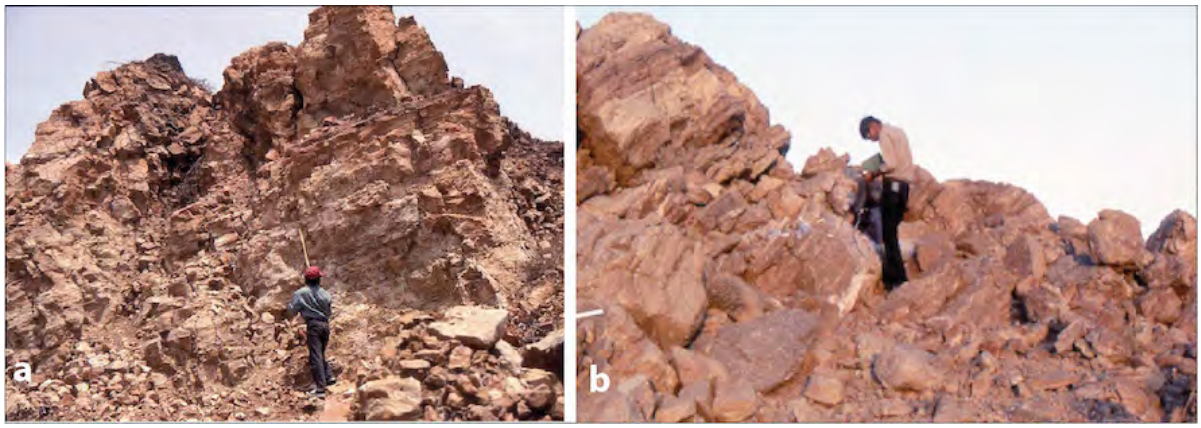

Figure 36 : The Olenekian red ammonoid limestones a) The overturned section of Basleo, Timor, b) The Wadi Musjah section of north-east Oman.

5.12 – Continuing geological education is offered to French high school teachers and the doctoral school to Lausanne students, 2011-2016

At the end of October 2011, I again collaborated with Thierry Juteau to lead a geology and ophiolite excursion of the Antalya Bay (South Turkey) and to co-author the field guidebook for the French high school teachers (Juteau & Baud, 2011).

At the end of October 2014, I led a fieldtrip on the Swiss Prealps Trias and wrote a field guidebook.

At the end of October 2016, I organized and led a 10-day geological education fieldtrip in South and North Oman and wrote the field guidebook (Baud, 2016).

In February 2016, I co-organized a 10-day Lausanne doctoral school in the Oman Mountains and the Batain Plain with Prof. Stefan Schmalholz of the Geological Institute of the University and Prof. Jean-Pierre Burg from ETH Zurich, with the aim of providing the PhD student in Geology from Lausanne with continuing geological education (Figure 37). I also co-authored the field guidebook for the program (Burg & Baud, 2016).

Figure 37 : Participants of the Lausanne doctoral school on Olenekian papery limestone of the Buday'ah outcrop of N. Oman, b) J.P. Burg and the author.

5.13 – Dedication of two genera and three new species bearing my name and described by paleontologist's colleagues.

In paleontology and geobiology, it's customary to name fossil organisms after known researchers to honor them. Two genera (*Baudiella* and *Baudicrinus*) and 3 species names (*baudi*) of fossil organisms including an ostracod, two foraminifera, a crinoid and an ammonoid have been dedicated to me, for my fieldwork and publications :

1. In 1998, foraminiferal specialists Demir and Ozkan-Altiner dedicated the new genus *Baudiella* to the director of the Lausanne Geological Museum, for his contribution to the study of the Permian-Triassic of the Tethys (Altiner & Ozkan-Altiner, 1998).
2. In 2015, Tatsuo Oji, a specialist in Sea Lilies (Echinoderms), together with Richard Twitchett, dedicated the new genus *Baudicrinus* to Aymon Baud, who first discovered a limestone boulder of Griesbachian age in the Wadi Wasit in Oman, and the species *krystsyni* to Leopold Krystyn, who determined and confirmed it (Oji & Twitchett, 2015).
3. In 1996, ostracod specialist Sylvie Crasquin dedicated the species *Polycope baudi* to the director of the Musée de Géologie in Lausanne, in recognition of his successful participation in geological research in the Triassic Dobrogea in Romania (Crasquin-Soleau, 1996).
4. In 2007, Permian foraminifera specialists Jérémie Gaillot and Daniel Vachard dedicated the species *Labioglobivalvulina baudi* to Aymon Baud of the University of Lausanne for his contribution to Permian-Triassic research (Gaillot, J., & Vachard, D., 2007).
5. Thomas Bruehwiler, a specialist in Triassic ammonoids, dedicated the species *Paranannites baudi* (Fig. 38) as a token of his research in Oman (Brühwiler et al., 2012).

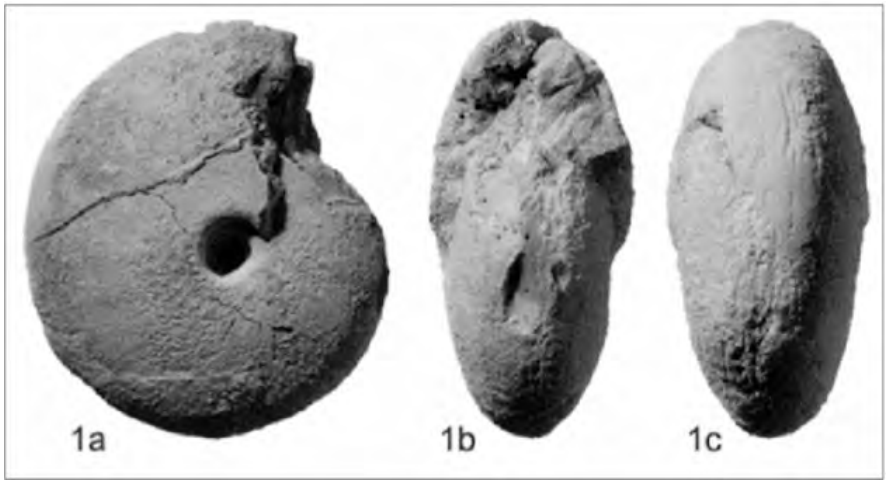

Figure 38 : The new species *Paranannites baudi* (figure 1 from Bruehwiler et al., 2012).

5.14 – Contribution to the History of Geological Science

Given that I was interested in the life of the first Professor in Geological Science at the University of Lausanne, I wrote a historic article on "L'enseignement académique de la géologie à Lausanne de 1832 à 1906 : Eugène Renevier et les naturalistes géologues" (Baud, 2019).

Interested in the history of the study and discoveries of the global marine Permian-Triassic boundary sections, I wrote "Over a century of adventures and controversies". At the global summit on P-Tr mass extinction and catastrophic climate change held in Wuhan, I wrote an abstract (Baud, 2013b) and I published the 21-page narrative in Albertiana (Baud, 2014).

At the HKT 2018 meeting in Lausanne I had the opportunity to make a review on geological research results of the Lausanne team in Himalaya and Tibet before 1988, give a talk, sent an abstract and a poster (Baud, 2018c). I got the opportunity to review the geological research results of the Lausanne team conducted in the Himalaya and Tibet prior to 1988.

5.15 – Tribute to deceased colleagues

In chapters 4.3 and 4.4, I present tributes to my friend and colleague Jean Marcoux.

I have been sharing fieldwork and adventures related to the Subcommission on Triassic Stratigraphy (STS) with Edward Timothy Tozer (1928–2010) for about 30 years. For this reason, in 2012, I wrote an illustrated report of our meetings (Baud, 2012a).

After learning of the passing in 2012 of Professor Emeritus Augusto Gansser (1910–2012) of Zurich, with whom I had the pleasure of interviewing in 2002, I chose to pen a brief biographical note about his remarkable career (Baud, 2012b).

When I discovered at the end of 2017 that my friend and colleague, Professor Emeritus Maurizio Gaetani (1940–2017) of Milano, had passed away, I published an illustrated tribute to him (Baud, 2018d), as well as in the HKT poster.

I was shocked to learn of Professor Michaela Bernecker's unexpected death on November 3, 2017, having worked and published with her at GuTech, a German university in Oman. Along with Dr. Oliver Weidlich, we wrote a piece about the amazing teacher, scientist, and friend Michaela Bernecker (1963-2017) in (Weidlich & Baud, 2019).

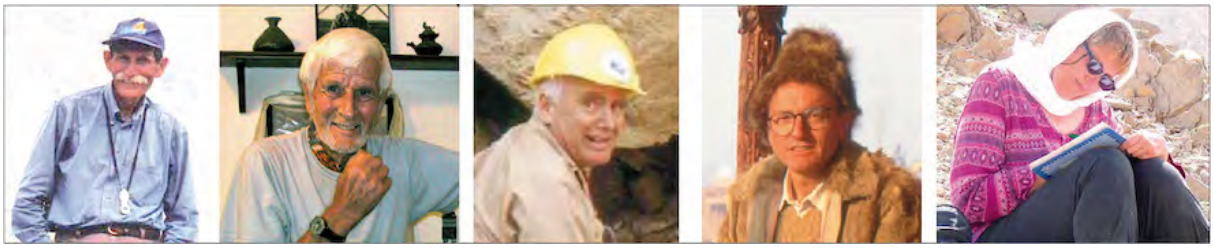

Figure 39 : From left to right : Jean Marcoux, Augusto Gansser, Edward Timothy Tozer, Maurizio Gaetani and Michaela Bernecker.

Conclusions and acknowledgments : the end of the Sinergia program (Paleo C4) and the "Across the End Permian Great Extinction" conference from August 30 to September 2, 2023, in Lausanne

The study of post-extinction microbialite was successfully applied in South China, where it introduced the idea of sponge-microbial buildups. It was also examined in Lower Triassic sections in Central and North Iran, and it was discovered in new sections of Armenia that had enormous sponge-microbial buildups (Baud 2023).

Field study of the Batain area of SE Oman with H.Bucher's research team led to the discovery of numerous fossil-rich blocks and of unknown Lower Triassic reefs, which greatly expanded the research line on basal Triassic quick recovery.

The paleontological study of collected samples in Zurich Paleontological Institute and Museum realized by the PhD students, assistants and professors offers more precise view on the stratigraphic age and facilitates greatly the correlation between distant Permian and Triassic basins.

The geochemical study of collected samples in UNIL's labs, realized by the PhD students, opened new approaches to the Permian-Triassic paleoenvironments.

My involvement in the Sinergia research program from the Universities of Zurich, Lausanne and Geneva has led me to collaborate with Professors Hugo Bucher, Torsten Vennemann and their PhD students (now Doctor of Science) Morgane Brosse, Marc Leu, Zoneibe Luz, Franziska Blattmann and Oluwasser Edward, as well as with Dr. Christian Vrard at the University of Geneva.

I had very fruitful exchanges with all of them, leading to joint presentations at numerous conferences, thesis chapters and publications. Thank you to all of you, dear colleagues, for sharing.

For the Permian-Triassic Conference in Lausanne, I benefited from the invaluable help of the organizing committee at the start of 2023, with professors Michel Jaboyedoff, Jean-Luc Epard, Torsten Vennenann and Thierry Adatte from the Earth Science Institute at the University of Lausanne, under the chairmanship of Allison Daley, Professor and Director of the Institute. The scientific committee comprised the following professors -Benoit Beauchamp (University of Calgary), Hugo Bucher (University of Zurich), Charles Henderson (University of Calgary), Nicolas Goudemand (ENS Lyon), Jonathan Payne (University of Stanford), Sara Pruss (Smith College, Northampton, MA). These two committees ensured that the "Across the End Permian 'Great Extinction'" conference, held from August 30 to September 2 in Lausanne, ran smoothly. My warmest thanks go to them all, as well as to all those who contributed to the nice running of the conference, and who are mentioned by name in the minutes on page 204 of this "Mémoire de Géologie".

My gratitude also goes to all the conference participants, and to all those who associated me with their presentations as co-author or in their aknowledgenments.

For this "Mémoire", my special thanks go to Madame Catherine Schlegel Rey, editor of this special volume, and Luca Spallitta, for the page layout in InDesign. The English text was reviewed by Scholars Editing and the French text corrected by Monique Baud, who has also encouraged me in my research over the years and accompanied me on several expeditions, thanks again.

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