

# Johannes Hämmerli and Nicolas Greber receive the 2018 Paul Niggli Medal

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The Paul Niggli Medal is Switzerland's most prestigious award for young earth scientist who made outstanding contributions in the research fields of mineralogy, geochemistry, petrology, resource geology or solid-earth geophysics. The Paul Niggli Medal honours and supports young ambassadors of Swiss geoscience, who are either Swiss citizens or obtained at least two of their academic degrees in the Swiss university system (BSc or MSc and usually their PhD).

The Board of the Paul Niggli Foundation decided, in their session of 8 June 2018, to exceptionally award the Paul Niggli Medal for the year 2018 to two equally deserving recipients: Johannes Hämmerli and Nicolas Greber.

J. Hämmerli, in recognition of his outstanding research contributions in the area of fluids and element mobility during metamorphism, in crustal differentiation and evolution with applications to ore deposit formation using novel microanalytical techniques.

N. Greber, in recognition of his outstanding research contributions in the area of magmatic processes, core-mantle differentiation and the chemical evolution of the continental crust through time using novel analytical techniques.

*Maria Schönbächler (ETH Zürich)*

*On behalf of the Foundation Council of the Paul Niggli Stiftung*

## 1 Citation for Johannes Hämmerli



The award of the 2018 Niggli medal to Johannes Hämmerli reflects the excellence he has achieved in mineralogy, geochemistry, petrology, and resource geology. Johannes developed groundbreaking in situ measurements of isotopes in metamorphic minerals and applied this technique to various rock types, linking top-end geochemistry with detailed petrography, petrology and mineralogy. Johannes is already a leader among a new generation of Earth Scientists, who are not getting specialized in a narrow field, but widen up their expertise and link together diverse research fields with different approaches in process-oriented studies. He has contributed significant papers, from testing methods, to the development of standards as well as

the application to metamorphic terrains and the formation of ore deposits.

Johannes did his undergraduate and Master studies at the University in Bern, where he focussed on petrology and tracing of fluids in the crust, providing an excellent background for the advanced geochemical studies that followed during his PhD and postdoc years. His PhD work under the supervision of Carl Spandler at the James Cook University in Townsville, Australia examined major and trace element mobility coupled with in situ Sm–Nd isotope analysis during Barrovian-style prograde metamorphism using field areas in Australia. Johannes received the “Deans Award for Excellence” from James Cook University for his PhD thesis. In 2014 Johannes received an SNF early postdoc mobility grant and moved to the University of Western Australia to work with Tony Kemp, investigating crustal evolution using in situ isotope microanalysis of minerals. Since 2016 Johannes is associated to a large Australian research project investigating the potential of accessory minerals in exploration targeting. I am very pleased that the next step in Johannes’ career will be back to the University of Bern, where he will start an Ambizione fellowship in mid 2019. On behalf of the researchers that supported the nomination I would like to congratulate Johannes Hämmerli for this great achievement and wish him all the best in the next stage of his career.

*Jörg Hermann (University of Bern)*

## 2 Response

I am very honoured to receive the Paul Niggli Medal and I would like to thank the board members of the Paul Niggli Foundation for their consideration and my mentors and colleagues for nominating me for this prestigious award. It was a great experience to receive the Paul Niggli medal at the Swiss Geoscience Meeting 2018 in Bern. I would like to take this opportunity to briefly describe the 9 + year round-trip journey from Bern to Townsville to Perth and soon back to Bern and how it has laid the foundations for me receiving this award. I would foremost like to thank my supervisors and mentors who inspired and influenced my research over these 9 years and who opened many doors in my academic journey. Also, a big thank you to Jörg Hermann for the kind laudatio and citation.

My interest in Earth Sciences research was triggered during my Master studies at the Institute of Geological Sciences at the University of Bern, when I joined the rock-water interaction group led by Laryn Diamond. My Master thesis focussed on characterizing fluid inclusions in the bedrock at a planned spent nuclear fuel repository site in Finland to reconstruct past fluid properties and to predict

how much gas could potentially be released in the future. The mentorship and enthusiasm from Laryn Diamond, Florian Eichinger, and Nick Waber made my decision to pursue a scientific path and easy one. In 2010 I was awarded a scholarship to take up a PhD position at James Cook University in tropical Townsville, Australia, under the supervision of Carl Spandler, whom I met previously in Bern when he was working there with Thomas Pettke. My PhD studies focussed on applying micro-analytical tools to gain insights into fluid-rock interaction during metamorphism, associated element mobility, and the behaviour of radiogenic isotopes during prograde metamorphism on a mineral-scale. The overarching goals were to identify mineral phases, which control certain elements such as rare earth elements or base metals, and to monitor how and when during metamorphism such elements are redistributed between mineral phases and if certain elements are removed or added to the rocks during fluid-rock interactions.

The 4 years I spent in Townsville working on these projects were brilliant in every aspect and I enjoyed the tropical climate. One of the main reasons why I had such a meaningful and productive time in Far North Queensland was Carl. His mentorship, supervision, and guidance made my PhD a great experience. It was also Carl who introduced me to Daniela Rubatto and Jörg Hermann in Canberra, who I will be working closely with shortly. Additionally, during my PhD, Brian Rusk enabled me to continue working on and developing my skills in the field of fluid inclusions via collaboration studying a range of interesting ore deposits. Nick Oliver, who was just about to leave JCU when I arrived, remained an important mentor both in and out of the field. The combination of Carl, Nick, and Brian in the field surprisingly ended not in chaos, but in productive and fun trips to the Mt Lofty Ranges in South Australia and to the Mt Isa inlier in Queensland where I was able to pick up on a lot of their experience and expertise.

Tony Kemp was still at JCU at that time and he introduced me to the world of radiogenic isotopes when we tried to understand Nd isotope homogenization during metamorphism on a (sub-) grain-scale, and this approach became a key part of my further studies.

After completing my PhD in 2014, I was awarded a Swiss National Science Foundation Early Post Doc mobility fellowship, which enabled me to move across the Australian continent to the University of Western Australia to work with Tony Kemp. Again, I was very fortunate and privileged to have Tony as a great mentor and inspiring researcher who opened many doors on my journey and triggered my interest in working on some of the oldest rocks on Earth. These studies included some fantastic trips to the Yilgarn Terrane and the Pilbara Craton in Western

Australia. Thanks is also due to Marco Fiorentini, under whose guidance I remained at UWA and joined the ARC Core to Crust Fluid Systems team to continue work on crustal-fluid processes. In mid 2018 I was awarded an Ambizione Fellowship, which brings me after 9 years Downunder back to Switzerland, and to Bern in particular. I am very excited for this next journey and feel very privileged to work with Jörg Hermann, Daniela Rubatto, Thomas Pettke and other Institute members in both Bern and Lausanne and with the Swiss geoscience community in general. I am very grateful that thus far I have had the opportunity to not only work with very smart people but also with great personalities, which in my opinion is equally important. Finally, I would like to thank my father for the financial support during my studies in Bern and of course my always supportive partner Hannah.

*Johannes Hämmerli (University of Western Australia)*

### 3 Citation for Nicolas Greber



Nicolas Greber studied at the Institute für Geologie, University of Bern, and continued here for a PhD. Subsequently, Nicolas went on to fill a postdoctoral position at The University of Chicago, USA (Prof. Dauphas). Presently he is a postdoctoral researcher in Isotope Geochemistry, University of Geneva (Prof. Schaltegger).

In his PhD Nicolas found that Mo isotope ratios in molybdenite are significantly different from their host rocks, observing high temperature Mo isotope fractionation for the first time. This led to the hypothesis that Mo isotope ratios in silicate rocks can be heterogeneous, confirmed in a study of a magmatic fractionation suite. He further constrained the average Mo concentration of the mantle by analysing 30 komatiites from three continents to assess Mo systematics in the Bulk Silicate Earth, at least twice more precisely than previous published estimates. As their Mo isotopic composition matches published data on meteorites, he concluded that isotopic equilibrium of Mo was largely achieved between the core and the silicate mantle in early

Earth. His thesis received the faculty prize in the Geosciences 2015 (Philosophisch-naturwissenschaftliche Fakultät).

During his postdoc at the University of Chicago, Nicolas worked on the isotope composition of titanium in studies concerning thermal processing and gas-dust decoupling in the protoplanetary disk and as a potential tracer of evaporation/condensation in the solar nebula or magmatic differentiation in planetary bodies. Striking results concern the maturation of the continental crust. It was thought that the early continental crust was predominantly mafic. However, Nicolas' 2017 Science paper on "Titanium isotopic evidence for felsic crust and plate tectonics 3.5 Ga ago" concludes that Archean crust had a similar proportion of felsic to mafic rocks to the modern one. Prof. Dauphas wrote in his letter of support for this medal: "This is truly a landmark study that has led to a re-evaluation of existing constraints on the nature of the continental crust through time". A 2018 Nature paper co-authored by Nicolas complements this insight by applying triple-oxygen isotope composition ( $\Delta^{17}O$ ) and constrains both area and timing of the emergence of landmasses to between 1 and 3 Ga. This pins down the emergence of continental crust to near-modern average elevation and extent to the Archean - Proterozoic transition.

Nicolas already contributed to peer reviewed publications during his master and PhD, and continued to publish during his postdoc times. In total, he (co-) authored 18 peer-reviewed papers, achieving a h-index of 10 (ISI) only 4 years after he completed his PhD. Overall the career of Nicolas displays a vivid scientific activity, by finding novel applications of state of the art geochemical tools. Together with his scientific openness and his involvement in various collaborations Nicolas is a perfect example of 'young ambassadors of Swiss geoscience'.

*Thomas Nägler (University of Bern)*

#### Response

I am deeply honoured to receive the 2018 Paul Niggli medal, and I am thankful towards the Paul Niggli Foundation and its board members for their support. I feel grateful that my scientific ideas and the research I pursued during the previous years have been positively received and acknowledged by my peers. During my time as a student, my work at the Natural History Museum in Bern, my PhD at the University of Bern and my postdoctoral positions at the Universities of Chicago and Geneva, I was fortunate to always experience a positive and stimulating working environment. More importantly, I was always warmly welcomed by my colleagues, most of which became good friends. Here, I want to thank them all for their constant support and guidance and I would also like to

acknowledge the people that were most influential in my career and scientific development.

The lectures taught by Jan Kramers at the University of Bern during my undergraduate and graduate studies introduced me to the world of geochemistry and isotope geology. It intrigued me that he was not focused on one specific subject, but used chemical and isotopic tools to study a broad variety of topics, ranging from modern surface processes to ancient mantle dynamics. Clearly, this experience strongly influenced my decision to become an isotope geologist.

I would argue that my scientific career started with a part-time job at the Natural History Museum Bern under the guidance of Beda Hofmann. Beda introduced me to the extraterrestrial side of Earth Sciences and awakened my interest in how planetary bodies form, accrete and evolve during their infancy. It was thus an easy decision to accept an offer from Thomas Nägler to pursue a PhD thesis at the University of Bern, especially as his only condition was that part of my work needs to include advancing the isotope systematics of molybdenum. I highly appreciate the trust and freedom that Thomas gave me. He was a great mentor who not only challenged me intellectually, but also significantly increased my analytical skill set. Complementary to that, the constant support of and fruitful collaborations with Klaus Mezger, Thomas Pettke and Igor Villa led to an enjoyable and successful PhD thesis.

A Swiss National Science Foundation Early Postdoctoral Mobility Fellowship allowed me to advance my scientific career by joining the Origins Laboratory and the Enrico Fermi Institute at the University of Chicago. There,

I had the pleasure to work together with Nicolas Dauphas and use the newly developed isotope systematics of titanium to study the chemical evolution of the continental crust. I learned and benefited significantly from the scientific creativity of Nicolas, including using his method of translating isotopic data into quantitative models. My time in the United States was equally challenging, interesting and exciting, and I was fortunate to have met and collaborated with many enthusiastic scientists, including Andrey Bekker and Ilya Bindeman.

Subsequent to my postdoc in the United States, I decided to join the group of Urs Schaltegger at the University of Geneva. This position gave me the opportunity to delve into the systematics of radiogenic isotopes, to learn techniques amenable for high-precision U–Pb dating of zircons, and to increase our understanding of how massive volcanic eruptions influenced the evolution of life. Urs established a uniquely open minded and stimulating working environment in Geneva, which is revealed by numerous interdisciplinary collaborations. I was also fortunate to have met with Joshua Davies and Federico Farina, two other postdocs that share similar interests, and with whom I had many thought provoking scientific and non-scientific discussions.

Many more people and friends supported and helped me throughout the years and I would like to acknowledge them all here. A special thank you goes to my family for their constant unconditional support and encouragement!

*Nicolas Greber (University of Geneva)*