

# NÖRDLINGEN - „IMPACT PROCESSES IN THE SOLAR SYSTEM“

## September 20-23, 2021

Sunday 19 [Kaiserhof Hotel Sonne, Marktpl. 3, Nördlingen](#)

19:00-21:00 *Icebreaker*, [Ries Krater Museum, Eugene-Shoemaker-Platz 1, Nördlinge](#)

### Monday 20

09:00 – 09:15 **General remarks**, [2nd Home Hotel, Luntentuck 9, Nördlingen](#)

09:15 - 10:00 **Impacts processes in the Solar System** Thomas Kruijer

General Overview: fundamental processes in the solar system? What can we learn from the crater record? Why does impact cratering play a central role in TRR170

10:00 - 11:00 **Principles of shock waves** Kai Wünnemann

Hugoniot equations, planar impact approximation, unloading and post-shock temperatures, contact and compression stage

11:00 - 11:15 **Coffee break**

11:15 – 12:30 **Impact cratering: Excavation processes** Kai Wünnemann

Excavation and ejection of matter, scaling laws to predict crater size, cratering experiments and modelling

12:30 - 14:00 **Lunch break**

14:00 – 15:00 **Impact cratering: Crater Collapse (1)** Kai Wünnemann

Crater collapse, formation of simple and complex craters

15:00 - 16:00 **Impact cratering: Crater Collapse (2)** Kai Wünnemann

Basin formation, ejecta deposition, geophysical signatures

16:00 - 16:15 **Coffee break**

16:15 - 18:00 **Exercise** Kai Wünnemann,  
Christopher Hamann

Estimate shock pressure, crater size, ejecta distribution for a given impact scenari)

## Tuesday 21

<b>09:00 - 09:30</b>	<b>Geology of impact craters, <a href="#">2nd Home Hotel, Luntentuck 9, Nördlingen</a></b>	Christopher Hamann
	Structural geology at terrestrial examples	
<b>09:30 - 10:30</b>	<b>Impactites – shatter cones &amp; rock types</b>	Christopher Hamann
	Shatter cones, breccias, melt rocks, ejecta deposits, classification schemes	
<b>10:30 - 10:45</b>	<b>Coffee break</b>	
<b>10:45 - 11:45</b>	<b>Impact ages - Isotopic dating techniques</b>	Thomas Haber
	An Overview over the different dating methods used to determine absolute ages of impact melt rock with a focus on (1) when best to use which method, (2) how to evaluate the quality of age data and (3) some common problems with the different methods and how to avoid them.	
<b>11:45 - 12:45</b>	<b>Geochemical tracing of impactor material – the fate of the projectile</b>	Philipp Gleissner
	Method overview (isotopic systems, siderophile elements, potentials and limitations); case studies of terrestrial and lunar craters; how to determine highly siderophile element ratios of lunar impactites? The regression method and its many problems, composition of material accreted late to the lunar surface	
<b>12:45 - 14:00</b>	<b>Lunch break</b>	
<b>14:00 - 15:30</b>	<b>Dating of planetary surfaces by crater counting technique</b>	Harald Hiesinger
	Production function, chronology function, relative and absolute ages, caveats and limitations of crater counts	
<b>15:30 - 15:45</b>	<b>Coffee break</b>	
<b>15:45 - 18:00</b>	<b>Exercise: Crater counting</b>	Harald Hiesinger with support from Wajiha Iqbal, Astrid Oetting & Barbara Giuri
	Practical exercise of determining relative and absolute model ages from CSFD measurements	

## Wednesday 22

<b>Group A:</b>	<a href="#">Zentrum für Rieskrater- und Impaktforschung Nördlingen (ZERIN), Vordere Gerbergasse 3, Nördlingen</a>	
<b>10:00 – 11:00</b>	<b>Shock metamorphism</b>	Markus Patzek with Christopher Hamann
	Introduction to the practical microscopic analysis of shock effects in terrestrial impactites, type of shock effects in rock-forming minerals	
<b>11:00 – 12:00</b>	<b>Shock and brecciation on meteorite parent bodies</b>	Markus Patzek with Christopher Hamann
	Meteorite classification and frequency of different types; Basic shock effects in meteorites (e.g., based on Stöffler et al., 1991); Characteristics of breccias (monomict, polymict, accretionary, and Regolith breccias; impact-induced fragmentation, mixing, and re-lithification); Brecciated differentiated meteorites (e.g., ureilites, HEDs, aubrites); Brecciated chondrites (all types); Formation of 2. generation meteorite parent bodies by re-accretion (e.g., Almahata Sitta, Kaidun, CM-chondrites)	
<b>12:00 – 13:30</b>	<b>Lunch break</b>	
<b>13:30 – 18:00</b>	<b>Practical: Microscopic analysis of shock effects in meteorites and impact</b>	Markus Patzek with Christopher Hamann and support from Jakob Storz und Ann-Kathrin Krämer
<b>15:30 – 15:45</b>	<b>Coffee break</b>	
<b>Group B:</b>	<a href="#">in front of Kaiserhof Hotel Sonne</a>	
<b>10:00 – 10:15</b>	Pick up of lunch bags and get on buses	
<b>10:15 – 18:00</b>	<b>Field trip to Nördlinger Ries Lunch</b>	Gisela Pösges, Harald Hiesinger, Kai Wünnemann

## Thursday 23

<b>Group B:</b>	<b>Zentrum für Rieskrater- und Impaktforschung Nördlingen (ZERIN), Vordere Gerbergasse 3, Nördlingen</b>	
<b>10:00 – 11:00</b>	<b>Shock metamorphism</b>  Introduction to the practical microscopic analysis of shock effects in terrestrial impactites, type of shock effects in rock-forming minerals	Markus Patzek with Christopher Hamann
<b>11:00 – 12:00</b>	<b>Shock and brecciation on meteorite parent bodies</b>  Meteorite classification and frequency of different types; Basic shock effects in meteorites (e.g., based on Stöffler et al., 1991); Characteristics of breccias (monomict, polymict, accretionary, and Regolith breccias; impact-induced fragmentation, mixing, and re-lithification); Brecciated differentiated meteorites (e.g., ureilites, HEDs, aubrites); Brecciated chondrites (all types); Formation of 2. generation meteorite parent bodies by re-accretion (e.g., Almahata Sitta, Kaidun, CM-chondrites)	Markus Patzek with Christopher Hamann
<b>12:00 – 13:30</b>	<b>Lunch break</b>	
<b>13:30 – 18:00</b>	<b>Practical: Microscopic analysis of shock effects in meteorites and impact</b>	Markus Patzek with Christopher Hamann and support from Jakob Storz und Ann-Kathrin Krämer
<b>15:30 – 15:45</b>	<b>Coffee break</b>	
<b>Group A:</b>	<b>in front of Kaiserhof Hotel Sonne</b>	
<b>09:00 – 09:15</b>	pick up of lunch bags and get on buses	
<b>09:15 – 17:00</b>	<b>Field trip to Nördlinger Ries</b>  Lunch	Harald Hiesinger, Gisela Pösges, Kai Wünnemann
<b>17:15 – 18:00</b>	<b>Final discussion</b>	

**Friday 24**   **Departure**