

# In memoriam: G. Christian Amstutz (November 27, 1922)

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Professor Dr. Dr. h.c. mult G. Christian Amstutz, a key personality in the history of the Society for Geology Applied to Mineral Deposits (SGA), died on June 23, 2005 in his home in Sigriswill, Switzerland, at the age of 82\*. He had received numerous distinctions including several Doctor and Professor honoris causa awards. He was an honorary member of SGA.

SGA is strongly indebted to Christian Amstutz. He had, together with A. Bernard, K.C. Dunham, P. Evrard, E. Grip, G.L. Krol, J. Lombard, I. de Magnée, A. Maucher, P. Routhier and P. Zuffardi, a central role in the foundation of the Society. It was at his office at the University of Heidelberg, where, on June 19-20th, 1965, the Provisional SGA Executive Committee was formed (Fig. 1). He became the first Chief Editor of *Mineralium Deposita*, the scientific journal launched by SGA in 1966.

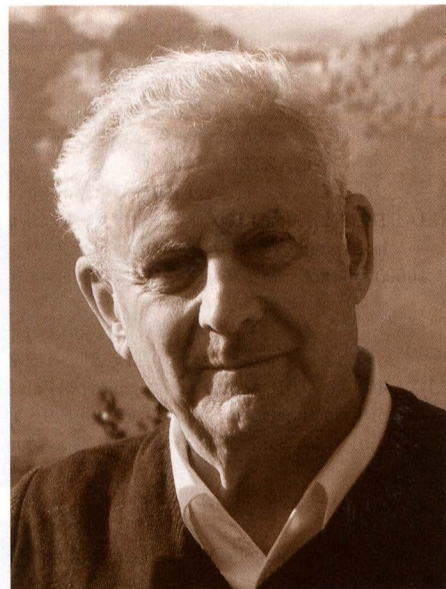
Christian Amstutz was born in 1922 in Vorderfultigen, a village in the Swiss Alps close to Bern as the son of school teachers. After secondary school in Bern, he studied at the ETH of Zurich, where he obtained a Ph.D. in Petrology with Prof. Paul Niggli on Permian alkaline volcanic rocks in the Alps.

He spent three postdoc years in the USA (Seattle and Boston). In 1952, he moved to Peru to head the Mineralogy Laboratory of the Cerro de Pasco Corporation at La Oroya. There, working for the company that dominated the exploration and mining business in Peru, he spent four years that were critical for his later professional career. Theoretically, his task was to assist the staff of the Cerro de Pasco Corporation in mineralogical and metallurgical problems but, given the strong scientific curiosity which characterized Christian Amstutz all along his life, he used this opportunity to work and publish on a large range of topics, which included not only mineralogy, petrology, and metallogeny, but also metallurgy, gemology, tectonics, geomorphology, and paleoclimatology. Even paleontologic and botanic publications arose from this period.

He and his students largely profited from this "Peruvian epoch", not only by the development of research topics, but very importantly, through personal contacts with colleagues from industry.

In 1956, he was appointed Professor of Economic Geology at the University of Rolla, Missouri, then Missouri School of Mines. There, he proposed a controversial early to late diagenetic genetic model for Mississippi Valley-type deposits (e.g., Amstutz et al. 1958, 1964). In these years he published the article "Syngeneses and epigenesis in petrography and ore deposits" (1958-1961), which had a large influence in the metallogenic world of the sixties and seventies, as well as innovative papers on many other subjects. These include one of the first publications on lead isotopes (1957) in ores of South America, but also papers on Liesegang rings (1958), structural features of the Moon (1963), crystal physics (e.g. 1964), discussion of impact theories (1965), history of Science (1965), or symmetry in nature and art (1966), to name only a few examples.

In 1962 Christian Amstutz was called as Director of the prestigious Mineralogical Petrological Institute at the University of Heidelberg, as the successor of the legendary Paul Ramdohr (1890-1985). With enthusiastic engagement he built one of the strongest groups on Economic Geology in Europe. Many dozens of students from all continents obtained their Master (Diplom) and Doctor degrees under his supervision on a variety of subjects, mainly but not only, in Economic Geology. As noted above, it was in Heidelberg where he and Paul Ramdohr invited other colleagues to found SGA and *Mineralium Deposita*, with the goal to create a truly international counterpart to the - at that time - strongly USA-centered journal *Economic Geology*. As a sign of openness in a time when English was not yet the lingua franca it has become nowadays, also articles in German and French were accepted in *Mineralium Deposita*, something that did not cause any problem



to the polyglot Christian Amstutz. Thus, the first volume of *Mineralium Deposita* included 26 contributions in three languages of authors from 12 countries from Western and Eastern Europe, North America, Australia, and Africa.

Christian Amstutz wrote numerous articles and edited several books. The classical books "Sedimentology and Ore Genesis" edited by him in 1964 and "Ores in Sediments", edited together with A.J. Bernard in 1973, as well as the chapter by Amstutz and Bubenicek entitled "Diagenesis in sedimentary mineral deposits" in the book "Diagenesis in Sediments" edited by Larsen and Chillingar in 1967, illustrate the strong impulse given by Amstutz to the study of ores in sedimentary rocks, certainly one of the most innovative aspects of his career. Concepts such as facies analysis, paleogeography, diagenesis, and basin evolution had to be slowly introduced into the world of ore deposits, which for a long time had been mainly interested in "hard rocks" and magmatic processes. Christian Amstutz, as a teacher, as an author and editor, contributed decisively to the change of the perspective in the study of ores hosted in sedimentary rocks, and particularly of those of base metals. Other books edited by him include "Glossary of Mining Geology" (1971), "Ore Genesis - the State of the Art" (1982), "Process Mineralogy of ceramic materials" (1984), "Stratabound ore deposits in the Andes" (1990).

Christian Amstutz was a person with very broad interests, which extended beyond Metallogeny and Earth Sciences. These included Philosophy, Psychology, History, Literature, and Music. His external interests had a significant influence on his scientific outlook. One of his favorite topics, pro-



Fig. 1. Early talks on the foundation of the SGA and Mineralium Deposita. The meeting was held in Professor Amstutz's office at the University of Heidelberg on 19/20, June 1965. Sitting (from left) A. Maucher, J. Lombard, P. Routhier, P. Ramdohr, G.L. Krol; standing: A. Bernard and C. Amstutz (Photo: <http://www.e-sga.org/index.php?id=13>).

bably an outcome of the courses by G.C. Jung he attended in Zürich, was to trace the "relationships between the general cultural trends and the evolution of thoughts in ore genesis" (Fig. 2). He liked to point out that consciously or subconsciously preconceived hypotheses had a strong influence on scientific theories and he considered the interpretations of some ore deposits as epigenetic as the result of cultural thought patterns. He claimed that scientists should critically take into account and filter the "thought archetypes" inherent in any culture, and try to construct clean working hypotheses which should be congruent with a combination of geometric (particularly cross-cutting relationships) and geochemical observations of ore and host rock at several observational scales, a statement with which most metallogenists would agree.

G. Christian Amstutz's preoccupation with connections between the cultural and philosophical heritage of a scientist and the potential for interpretive bias did not prevent him to have exceptionally strong convictions on the genesis of ore deposits and rocks, convictions that now we may believe were not always congruent with the observational basis. We would like to end this obituary with the quotation he used in the opening article of the first volume of *Mineralium Deposita*, a quote that best summarizes the main message he delivered to his numerous students:

"For the purpose of research is not to imagine that one possesses the theory which alone is right, but, doubting all theories, to approach gradually nearer to truth. (C.G. Jung, 1959, *Basic Writings*, Modern Library, p. 379).

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Historical periods	Emphasis on syn-endo or at least on syn-exo	Balanced theories with observational classifications	Emphasis on epi-exo or at least on epi endo
Old Greek, Roman, Arabic, Indian and Chinese theories	various theories displaying all basic patterns of thought		
Albertus Magnus (1193/1205–1280)	earth	metals	Hg + S ore minerals
Congenerationists (about 1300–1500)	everything is congenetic		
Agricola (epigeneticists) (1494–1555)	fire is main agent		
Neo-congenerationists (in part Werner, 1749–1807, and his school)	water is main agent		
Von Cotta and Von Groddeck (about 1830–1890)	observational geometric classifications		
Neo-epigeneticists (Posepny, Lindgren in part, Niggli in part)	fire + water main agents		
1960: Detailed spacetime differentiations and determinations (symmetry, i.e., fabric studies, esp. in sediments of decisive importance) <sup>1</sup>	observational geometric and inherent geochemical classifications main basis for genetic interpretation: congruent = syngenetic + non-congruent = epigenetic		

Fig. 2. Relationships between the general cultural trends and the evolution of thoughts in ore genesis (Amstutz, 1964).

<sup>1</sup> Geometric and geochemical distribution patterns (primary fabrics and compositional histograms) inherent to the host rock are first compared before causes from without are assumed.

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