

## “The Man of Sustainable Development in Iron Making”

A Laudation to Heinrich-Wilhelm Gudenau

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Since the Hittites, a tribe living 3,000 years ago in Anatolia/ North Turkey, started to produce iron and steel for use in daily life. Those materials are the basis of our culture and development. With continuous and common effort, the human beings form housings, mobility devices, communication lines and power stations to make sure the reproduction of their species. Sharp precision scalpels in hospitals and swords for war, ships for transportation of goods or exploration as well as tanks for destruction are made of steel, and steel comes from iron ore. This matter is a sediment mineral, deposited in the earth 2,000 million years ago, coming from the outer space forming our planet, unimaginable ages ago. Today, we like our cars, we take a bus or a train, we use many bridges over wide rivers, mostly without thinking of the origin of the stuff those indispensable goods are made of.

The metallurgy is the key to our modern society because it produces 1.6 billion tonnes of best steel for our daily use, annually. And the price of 1 kg of high-end steel grades is less than the price of 1 liter of cow-milk or sparkling mineral water! Everybody enjoys the benefits of strong, reliable, useful steel sheets, plates, pipes or wire, also daily. To make sure that this pleasure is a sustainable one, it needs people who dedicate their lives to the enhancements of iron and steel technology.

One of the most famous contemporary persons, who we all owe so much, is in the focus of this “2015 – Sustainable Industrial Processing Summit & Exhibition”: Mr. Heinrich-Wilhelm Gudenau from Aachen town in Germany. For several decades until nowadays, he is busy in development of both knowledge in iron and steel making and education of gifted people, feeling the same way. All the time in responsible positions, he followed one clear goal: the sustainable development of iron and steel making. For him, sustainability means that we work in a careful way on our resources with high efficiency, so that our generation and all following generations will be able to produce their own iron and steel to fulfil their own demands.

‘Iron making’ means the application of hot reduction gases to iron ore that stone-like matter mined from the ground. The two essential reduction gases are carbon monoxide and hydrogen, and during the last thousands of years the carbon monoxide is the essential way of

choice. Though, Heinrich-Wilhelm Gudenau, who is called HeiWi {*hai-vee*} by his friends, dedicates his power to blast furnaces, direct reduction processes and coal gasification to make sure that those gases will be available also under critical conditions and will be applied in an efficient way. Special investigations on fluid dynamics in a period when computers of extended power like today were not available; underground gasification of coal in depth of more than 1000 m to produce the reduction gas *in situ* had ambitious goals, 30 years ago. The so-called Direct Reduction of iron ore to generate solid iron metal directly without melting and carbon pick up was a target, which brought him in direct contact with Willy Korf, a pioneer and business man in that field. After his death, his daughter, Astrid Korf-Wolman, initiated a Foundation with the help of Prof. Gudenau. This foundation grants the “Willy-Korf-Award for Young Excellence”, which is given annually in New York meetings to the best followers: for example, the awardee Dr. Paulo de Souza, who built the famous successful Mars Planet Exploration Rovers “Opportunity” and “Spirit” in a NASA's research team.

Today, additionally, the foundation also grants the “Willy-Korf-Excellence-Lecture-Award”, which has been awarded to international personalities; like Prof. Gunnar Still from ThyssenKrupp Company, Mrs. Prof. Dagmar Juchelkova from the Czech Ostrava University, and Prof. Yanping Bao from the University Science and Technology in Beijing.

A pioneer of hydrogen application to iron ore reduction, Ludwig von Bogdandy, came in contact with Prof. Gudenau and one sustainable output of those meetings was the “Ludwig-von-Bogdandy-Award for Innovative Metallurgy” to support young powerful and busy metallurgists at Aachen University.

Heinrich Wilhelm Gudenau studied Metallurgical Engineering at the RWTH Aachen University where he graduated in 1967 as a diploma engineer; in addition, he studied economics and finalized in 1971. But during this time, he was also responsible of a foundry company at Dassel, Germany, prepared his doctoral thesis and a short time later, in 1972, he attained his postdoctoral lecturer qualification in the field of “Technology of Iron Making”. With this licence, he travelled to Japan, and for 2 years he gave lectures and did research at the Tokyo Institute of Technology in Japan, closely connected to the famous steel company Nippon Kokan, today JFE. Together with Professor Nagata, he investigated special details of iron making. Coming back to Germany, Dr. Gudenau made a good job as a senior researcher in his former Institute of Ferrous Metallurgy together with Prof. Schenck and Prof. Wenzel.

Already in 1982, the Faculty of Mining, Metallurgy and Geo-Sciences of RWTH Aachen University decided to call him a Full Professor in the field of “Process Technology of Metallurgy” for iron and steel making. He fulfilled this responsible task for 20 years, researching on sustainable development of metallurgy and education of young students.

That was not a boring job! Since “HeiWi” is a travelling man, always nosy on other cultures and technologies, he travelled over all continents of this globe to make contacts, networks, giving lectures and learn from the others. Here is a table of his stays all over the world:

Asia:	Madras University, India USTB, China Shenyang Univers., China POSTEC, South Korea Tokodai Univers., Japan Tohoku Univers. Sendai, Japan Chiba Univers., Japan
Australia:	Wollongong University
South America:	Porto Alegre Univers., Brazil Florianopolis, Brazil Volta Redonda, Brazil PUC Rio de Janeiro, Brazil Belo Horizonte, Brazil
North America:	McMaster Univers., Canada
Africa:	El-Tabbin-Institute, Egypt Assuit-Univ., Egypt Anaba, Algeria
Europe:	Techn. Univers. Stockholm, Sweden Techn. Univers. Helsinki, Finland State Mining Univers. Dnepropetrovsk, Ukraine Montan Univers. Leoben, Austria Tech. Univers. Freiberg, former GDR

Back home, he asked for picking up scholars to educate them in terms of iron and steel making. His faculty agreed, and many foreign researchers made a stay at the Iron and Steel Institute in Aachen. All of them worked under Gudenau’s supervision and finalized their doctor-theses to fulfil personal ambitions in the field of iron making research. Famous people from those projects are Prof. Tianyun Yang, later President of the USTB university, Dr. Heike Denecke-Arnold (Vice-President of ThyssenKrupp Steel company), Dr. Guido Kleinschmidt (CEO of the Plant Engineering company SMS-Siemag), Dr. Bodo Lungen (Vice-President of the German Steel Association VDEh), Prof. Paulo Assis in Ouro Preto, Brazil and Prof. Antonio Vilela in Porto Alegre, Brazil.

His steady and strong engagement in teaching and technical discussions has been noticed by the responsible administrations of many universities and they decided to give honor to “HeiWi” Gudenau. There are 3 Honorary Professorships which have been given to him:

- University of Science and Technology, Beijing, China
- Technical University of Shenyang, China, and
- State University in Dnepropetrowsk, Ukraine

Last but not least, he received the title “Honorary Member of the Iron & Steel Institute of Japan”.

The supervision of PhD works is extremely numerous; Prof. Gudenau has been involved in more than 300 doctoral theses, guiding the young scientists to academic successful results and to the examination for the doctoral degree, making sure the scientific growth and propagation. That means that it was necessary for him to look for money, the motor of technological research. Best contacts to the iron and steel industry and excellent results gave research projects to his academic chair to pay his staff of young researchers. Consequently, the number of about 700 scientific publications is a reference, which makes clear the status of his sustainable work. Very early, the field of PCI, the Pulverized Coal Injection, which is applied to nearly all modern blast furnaces today, has systematically been investigated; application of Fluidized Beds, today applied e. g. in the FINEX smelting process, was one of his favored topics.

Was there enough time for family and friends? Yes, certainly. Many former students, doctorands and colleagues drop in for a phone call or a visit; all are friends from a time of partnership and promotion. His wife Petra and the two sons, academics already, are always very hospitable. The private place, accommodating also the dog, seems sometimes to be an academic public place for the exchange of ideas and news. It seems to be the steadily reloading battery for the powerful motor of the warm-hearted person, who is, in fact, dedicated to iron, but does not consist of iron.

Life after retiring in 2001 is a busy continuation of the professional life: Prof. Heinrich Wilhelm Gudenau gives advices as a consultant to companies. He is involved in the preparation of the Willy-Korf-Awards, in the scientific board of the Austrian K1-Met research program, and also in the education of young students teaching “Special Chapters of Raw

Material and Iron Making". His advices are very welcome in the daily business of the Aachen steel institute.

Please accept our best thanks, Heinrich Wilhelm Gudenau, and we wish you lot of power for the Sustainable Development in the iron and steel world!