Rudolf Slavicek's Scientific Contributions

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Rudolf SLAVICEK died in Vienna (Austria) on the first of January this year at the age of 93. He was serene, with a sense of accomplishment. He was an inspiring, tireless, strong-willed man, inventor and philanthropist. He devoted his life to the mastery of integrated occlusion in oral functions, acquiring a world reputation. His many scientific contributions will not only not fade away, but will grow: so, he will not disappear.

HIS HISTORY

Through his medical training (doctor of medicine in 1954, with incipient knowledge of cardiology), his training in dentistry (certified in 1957), his specialised training in restorative and prosthetic dentistry (1958), in orthodontics (1958-60), but also through his passion for anthropology and anatomy, Rudolf Slavicek gained an extremely broad cultural base, while in Vienna, Austria, between 1946, the year of his baccalaureate, and 1960. It is on this very solid base that he will build a professional career rich in innovations. Between 1960 and 1975 he initiated his quest for knowledge by reading and meeting the great international authors in the field of oral functions and dysfunctions. He worked, for example, with Lauritzen, Lundeen, Wirth, Gibbs and Ramfjord. Parallel to his private practice in Vienna, he developed a teaching career at a late stage, in which he demonstrated that the combination of broad culture, intelligence and a willingness to share can generate creative results that had a considerable influence on the field of occlusion, which concerned all aspects of dentistry.

He himself said "I took my time joining an academic career". At the age of 50 (1978), he became an Associate Professor, defended his PhD in 1982, became a full-time University Professor in 1984, and was Dean of the Faculty of Dentistry in Vienna from 1992 to 1997.

He retired from the university in 1998, inviting all his close colleagues to a memorable farewell seminar in Vienna. This was not the end, but in fact a new start to a new teaching career at the private Danube University in Krems, where he offered master courses in oral function-dysfunction. He then founded VieSID (Vienna School of Interdisciplinary dentistry), which is managed by his son Christian Slavicek.

The training programmes provided by VieSID are attended by a large number of colleagues from many countries around the world.

There are now several VieSID branches in different countries. At the same time, in 2006, he created the "Summerschool" with the support of Sadao Sato and Jean-Daniel Orthlieb. Thus, first in Krems, then in Vienna, in collaboration with the dental faculty, every year for five days in July, many colleagues meet around his former students.

The event started with about 20 participants and now it has about 300 participants from 4 continents. (Fig. 1a,1b) The "summerschool" has become a cult event of an impressive scientific level in the warm atmosphere of a real family.

The topics are multidisciplinary, focusing on oral functions around orthodontics and prosthetics. Rudolf Slavicek had a nice formula to define orthodontics: "an orthodontic treatment is a great occlusal reconstruction with natural teeth".

Figure 1a. Second Summerschool in 2007.

Figure 1b. Summerschool in 2019.

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HIS WORK

Without being exhaustive, five major themes can be highlighted.

- Anterior guide or mandibular steering

In 1982, Rudolf Slavicek published an extensive research work combining morphological, cephalometric and axiographic analyses to better understand mandibular functions. He obtained his PhD and published his work in a first book "Die funktionellen determinanten des kauorgans - The functional determinants of the masticatory organ" [1]. He studied, among other things, the lingual morphology of the anterior teeth, the inclinations of the guiding slopes of the maxillary teeth (Fig. 2a, 2b); he developed the principle of absolute slopes (in relation to the reference plane (Fig. 3), the Axio-Orbital plane) and relative slopes (in relation to the occlusal plane) [2,3].

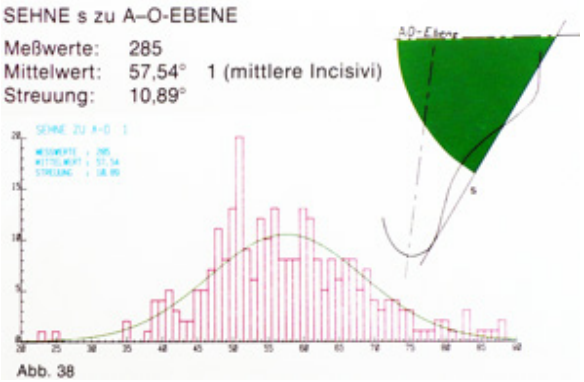

Figure 2a. Measurement of incisal slope from silicone impression cup N = 285, m = 57.54°, Et = 10.89°.

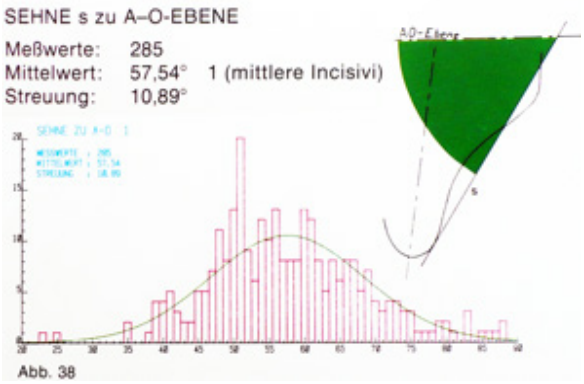

Figure 2b. Measurement of canine slope from silicone impression section N = 277, m = 48.73°, Et = 9.88°.

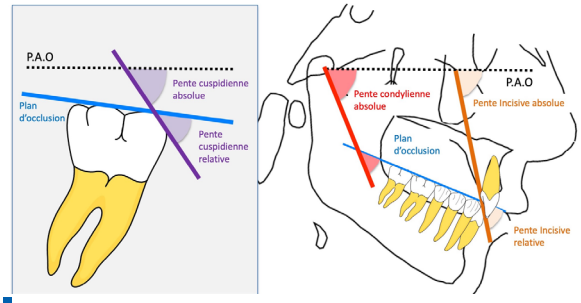

Figure 3. The determinants of guidance: absolute (/ Axio-Orbital Plan) and relative (/ Occlusion Plan) slopes.

Starting with this work, he would fundamentally optimize the concept of canine function by inventing the sequential guidance [4], the functional angle of freedom (Fig. 4), the retrusive control [5,6]. These are concepts to guide prosthetic or orthodontic reconstruction (Fig. 5), not rules to be found in all natural occlusions. He later proposed to replace the term guidance by the term control to emphasize the importance of proprioception of the anterior teeth.

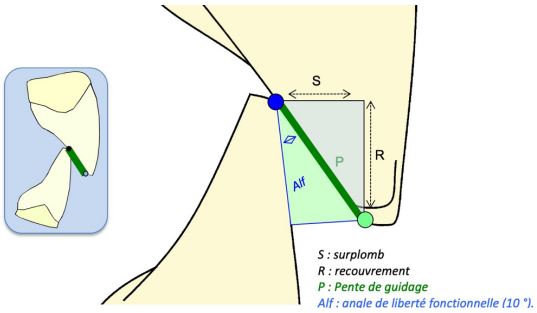

Figure 4. The functional angle of freedom: about 10° (allowing forward movements) it is to be found whatever the inclination of the anterior teeth, possibly compensating for skeletal shifts.

Figure 5. The Anti-Retroposition Guide (ARG): ideally located on the mesial side of the lingual cusp of the maxillary first premolar, it optimizes the occlusal guidance between OIM and ORC (less loaded, more discriminating area).

- SAM Articulator

Already before the 1980s, Rudolf Slavicek collaborated with a new company in Munich, the SAM company, to develop an articulator that was between the semi-adaptable and the fully adaptable articulator, but was still simple and precise to use. The SAM articulator will incorporate condylar housings and curvilinear Bennett inserts and will be an outstanding success; thanks to its precision, robustness and simplicity, it will be an exceptional success, which is still relevant today (Fig. 6a, 6b).

Figure 6a. SAM Articulator: (a) SAM I.

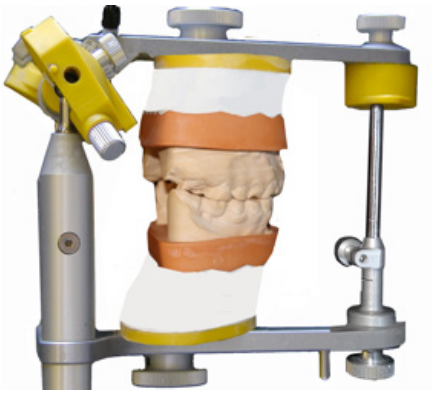

Figure 6b. SAM Articulator: (b) SAM II.

- *Axiography*

At the end of the 1970s, the development of axiography saw Rudolf Slavicek as a guest on various international podiums [7,8]. Derived from Campion (1902), Gysi, Lee, Lundeen, the axiograph proposed by SAM structures (Fig. 7a), with relatively simple means, the registration of condylar translations by eliminating condylar rotations [9]. In addition to measurements for the individual programming of condylar boxes, Rudolf Slavicek was able to develop a method for the diagnostic analysis of intracapsular TMJ disorders [10]. In the 1990s, mechanical axiography evolved with the development of electronic condylography CADIAX (Fig. 7b, 7c) by the Gamma company headed by Christian Slavicek [11].

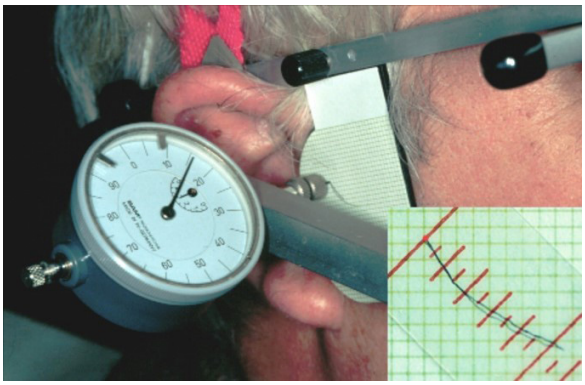

Figure 7a. From axiography to condylography: 1980, SAM mechanical axiograph.

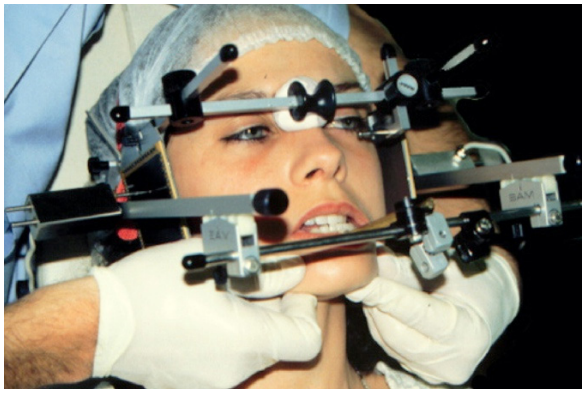

Figure 7b. From axiography to condylography: 1990, SAM electronic axiography.

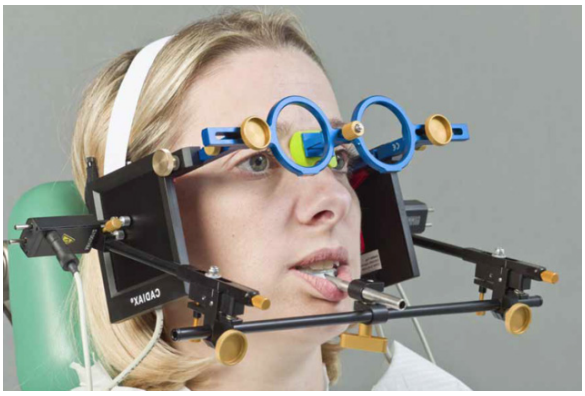

Figure 7c. From axiography to condylography: 2015, Cadiax - Gamma electronic condylography.

- *Cephalometry*

Also, at the end of the 1970s, Rudolf Slavicek developed a concept of global analysis that superimposes cephalometric, axiographic and occlusal (from the articulator mounting) data on the same axio-orbital reference plane [3]. These superimpositions allow the combination of condylar slope (axiography) and occlusal plane inclination (cephalometry) data to calculate the reconstruction of cuspidial slopes and guide slopes (articulator). Computerised cephalometry developed in the 1980s has evolved with the development of CADIAS software providing numerous possibilities for therapeutic simulation VOT (Fig. 8).

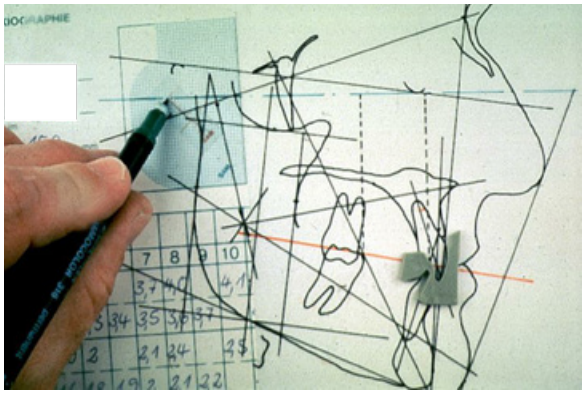

Figure 8. Superposition of computerised cephalometric tracings and mechanical axiographic tracing: CADIAX analyses in 2022.

- *Bruxism*

In 1984, Rudolf Slavicek supervised a university thesis defended by Karin Kail in Vienna. This visionary work introduces the manducatory apparatus as an organ for the discharge of emotional tensions, i.e. bruxism appears as a stress-relieving valve [12]. This concept was subsequently validated by numerous research studies published by Sadao Sato's team at the Kanagawa Dental University in Japan. This team work led to the development of the "Bruxckecker" (Fig. 9), a simple means of evaluating grinding bruxism [13].

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Figure 9. Bruxchecker: thermoformed splint, 0.1 mm thick, coloured red, worn overnight, showing the reality of occlusal confrontations by the traces of friction having erased the red dye. A simple, relevant, curiously unknown tool.

- Cybernetics

As Rudolf Slavicek matured and dominated the mechanical aspects of mandibular function, he was able to take a step back and integrate his occlusal-functional concept into the broader framework of the patient's whole organism [14]. This is embodied in the cybernetic concept of the "masticatory organ" (Fig. 10) published in his book "Das Kauorgan" in 2002 [15]. In 2008, supported by Spinger, he decided to publish a new peer-reviewed journal, International Journal of Stomatology & Occlusion Medicine (IJSOM). This European, multidisciplinary, "medical occlusion" oriented journal was intended to motivate and encourage his colleagues to publish their work in this forum of communication and discussion. Recently, Professor Slavicek published a new three-part book, "Concepts in Oral Medicine" (2016), which presents numerous illustrations of the holistic therapeutic approach according to the principles of the Vienna School.

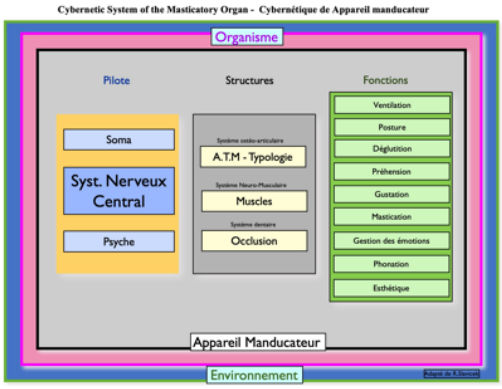

Figure 10. The cybernetic system of the multi-structural, multi-functional "masticatory organ" makes binary views obsolete.

CONCLUSION

Intelligence, broad scientific culture, simplicity, empathy, absence of sectarianism, clinical involvement and great strictness in implementation, characterize his brand and his "School" of thought. We can all see and more clearly when we stand on the broad shoulders of this giant.

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