22.<u>Very important movie.</u>1990.Strasbourg. Eurodentaire. palais des congrès. réalisation d'une Couronne (on live.VO ss titre GB).

Four users dentistes (Dr Georget -Blois, Dr Hinault – Tours, Dr Toubol – Paris and Dr Duret Bernard – Grenoble) who bought four systems from CFAO Hennson perform live on patient at the Palais des Congrès de Strasbourg (of the European Commission) a crown in the framework of the international dental congress «Eurodental».

This film, which lasts 7 minutes, is a summary made in 2015 from the film made live in Strasbourgs Congres and which lasts 2 hours (which I keep available if necessary). it is subtitled in English in each of the 4 steps: Optical Print, CAD, Machining and then coloring the crown in Aristée before it is put in the mouth.

It is extremely interesting because it shows what the Duret System has been doing since 1988.

Of particular note are the following:

Each step is commented on in English and *there are slides to see more details (in italics here)*

1. Both versions are presented, <u>one for laboratories</u> (from left to right the optical footprint station with the HMI and IOS, the CAD station (and its Digital Equipment Vax computer below) and the machine tool (with its closed-circuit lubrication system below) <u>and the other integrated in the dental office</u> for dentists (for the «dentist» version,
   slide: *the IOS camera (is on the left of the turbines), the CAD station on the right of the image and the Machine tool on the left).*
2. **<u>Step 1:</u>** (00.22 min) Optical Impression in the sinusoidal profilometer phase technology (fringes can be seen moving) in conical projection (4 teeth per view) that the sophisticated image processing software could straighten *(**slide:** the tip of Hennson's IOS was 3 times smaller than the cerec)* at the same time that it was able to bring together up to 18 different preparation and antagonistic views *(**slide:** here 12 views of the preparation and 2 green antagonists because they are validated by the software – red if not)* thanks to the spheres of correlation. Antagonist view on bite (00.45 min) *(**slide:** example of mordu technique taken up by cerec 10 years later)*
3. (00.55 min) Approximate indication of cusps, grooves, large contour line and contact area that the software moved automatically and exactly in the right place *(**slide:** also on the bite)*
4. (01.00 min) portion finish line on each view (***slide:*** *don't forget that the display on the Sony pro screen was sharper than on this film to draw without and with zoom*)
5. **<u>Step 2</u>**: CAD (01.23 min) appearance of the preparation after meeting of the 14 views *(**slide:** 4 views possible with in addition to windows for zooms)* and addition of the finishing line in a single line *(**slide:**and correction with zoom function and preparation section to better position the point).*
6. Space definition for cement (01.45 min): *(**slide:**here 250 µm on the occlusal surface, 10 µm on the sides (radial) and 0 µm on a height of 800 µm from the finishing line) (**slide:** illustration of my calculations coming from my theory stating that the intrados is not a simple dilatation, but must respect the dynamics of the fluid flow regarding granulométrie).*
7. Appearance (01.50 min) of mesial and distal teeth *(**slide:** example of the cloud of points with the lines of curvature of the arches of the occlusal crests + cuspids*; ***slide:*** *then the same after calculation of the preparation and the antagonists).*
8. Appearance of curved lines of arches (02.10 min): in addition to the theoretical teeth, the large curvatures of the occlusal gutter, lines of cusps, or large vestibular and lingual contours from the books of dental anatomy have been memorized for each of them *(**slide**: visualization of theoretical teeth (called typical in my 1973 thesis) that are in memory. They also serve as a reference base for proximal teeth).*

9. Appearance (02.28) on the preparation of the theoretical tooth not deformed. It automatically adapts to the finishing line, contact and reference lines 02.33 min) *(**slide:** example of adaptation of a 46 in vestibular, mesial, occlusal and axonometric view -3D- hidden by the zoom)*
10. Appearance (02.40 min) of the centerlines of the theoretical tooth (*example **slide** of the surface of the 46: the triangles are the cusps and the circles the crests*) which (02.52 min) move to respect the antagonistic centerlines and centric of the opposite occlusal surface *(**slides** of occlusion control sections at different levels, but especially; **slide** (03.01 min): very nice section often reproduced … without permission).*
11. Material thickness check,(03.10) there was a sound alert if the thickness was insufficient depending on the materials used *(**slide: with** dome correction vectors if the thickness was insufficient)*
12. **Step 3:** Fully automatic machining with the CNC machine tools (03.20 min) *(**slide:** lubrication system with the Precise compagny spindle)(**slide:** the 7 tools used – at the end, 9 was used) (**slide**: the tool paths in the inside-intrados part)*
13. Rotation of the preform (03.40 min) *(**slides** the machining steps of the different tools)* followed by the change of tools by rotation of the tool holder on the left *(**slide:** of the tool disc holder)(**slide:** paths of the tools for the extrados)(**slide** to 04.06: feed back wear and fracture control tool's sensor on routes)*
14. End of machining (04.15 min) (***slide** occlusal area of 26, then 15, then …)*
15. Perfect mouth pose - seals (04.42 min) before makeup.
16. Occlusal analysis (04.55 min) with articulated paper. Meanwhile, the Access Articulator (Hennson AA) , its two cameras and three LEDs appear on the thumbnail *(**slide:** FAG articulator that we modeled in 1984, **see movie #6**)* (video slide in thumbnail: movements of the Access Articulator in 3D reported on the 3 horizontal and sagital and frontal planes) *(**slide** of the paths of 2 special complementary tools for the gnathology or fonctionalist concept -very fine and respecting movement 3D direction in the space)*
17. **Step 4:** Aristée makeup (05.16 min) with a special kit. Meanwhile, the applications made by Hennson in 1990 and a 1992 Sopha application appear *(**2 slides** on the bridge application: tool paths for the bridge with respect to the clutches then; bridge machining)(**2 slides** of the Inlay application* (05.41 min)*with occlusal surface modelling and machining.* The first inlay was modelled in 1982 – see biblio) *(**slide** : unique new application of Sopha Bioconcept : Coping in 1992)*
18. Fitting of the crown in Aristée (composite heterogène structuré 3D) makeup by Bernard Duret *(**2 slides** for ODF: bracket modélisation with a groove adapted to the movement that one wants to impose -right arc technique- and its machining)*
19. Direct laying of this wreath (06.04 min). It is perfect. (***2 slides** from the beginning of the total prosthesis* 06.04 min- *and **2 slides** on the trace of the metal plates of Jourdat and Gaillard* - 06.10). The accuracy of the Hennson system was between 50 and 100 µm.

63 systems were sold and 1 was donated (mine for USC). 3 other systems were at experimental dentists. The first prototype system was installed between april and July 1986 in my dental office on the 1st floor in the adjoining studio of my prosthetic laboratory (and my 2 prosthetists Mrs Lafitte and Berthillot) (06.35 min). it cost between 150,000 FF (32,000 euros updated in 2018) in IOS version without CAD or Machine Tool and 500,000 FF in full version i.e. IOS, CAD and Machine Tool (108,000 euros updated in 2018). **People saying Hennson was very expensive are wrong, they were close to current prices.**

After that you can see the **direction's Team of Jean Pierre Hennequin at Hennson in 1985** with the Kuhlmann machine tool of the ADF and the surface modeling of Matra. Around **this great man in the history of dentistry,** we recognize Gille Deschelette (remarkable GEO), 3 engineers (including Manuella Tiberghien), a secretary, Jean Jacque Févier (Financial Director) François Duret and Jean Louis Blouin (very skilled technical director).

Cover of the 1987 JADA (Journal de l'Américan Dental Association) with the molar modelled by Manuela Tibergein in 1984 on my recommendations, some excerpts (06.55) from the presentation of the 1988 Chicago Midwinter (films 17 and 18) and finally the poster announcing the ADF congress in 1985.

This film is to be compared to film 23 on the Cerec presented the same year at the Yankee Dental Congress by Moerman and Brandestini.

These two films showing the only two systems that existed at the time give a good picture of the real state of the CFAO in 1990.