Introduction

Attached are **the comments and descriptions for each of the films** you can see on this page of my website. They are all evidence of what our work was between 1983 and 1993.

It marks the beginning of Dental CAD CAM (CAD CAM in dentistry) in the movies # 2 (1983) and # 4 (1985) and for exemple digital occlusion static and dynamic (movie #6 1985).

Most of them were carried out in public, which makes our work and our results totally credible and indisputable, unlike a fine published in a journal, even a scientific one. **We have always preferred to demonstrate rather than affirm.** It must be said that at the time just few professionals believed or had the knowledge to control publications and research occupied us more than 14 hours a day (is not it Jean Louis).

As you will discover, for exemple in the films # 17-18 (MidWinter Chiago 1988) or **especially on the # 22nd (Starbourg 1990),** all the current systems have been inspired by our work (or our specifications of 1984-85 and 1987 – see publication ANVAR here in my web page « publication ») and have copied them … without any shame. They even re-patent them!! It is both a joy, because we copy only what is quality and interesting, but also a frustration, **because they always forget to point out the numerous publications that accompanied them.**

He is even a dean of a famous university in CAM CAD, close to France, who recently asked me who I was to allow me to make a remark on false historical information in a International journal … of which I was one of «Editorial board» since its creation in 1998 (he certenly was not a dentist in 1980 !)

It is for this reason that I felt it necessary to recall, at 74 years of age and with these films **made by others** for the most part, what the team of **Hennson International** was so that we do not forget it.

As we are always told, we were probably “too far ahead”, **but that’s no reason to forget this great team**. Fortunately history always puts in place the truth hidden voluntarily … or not.

You will find in the title: the issue with the year of the film, followed by the place and/or congress where we were filmed, the date of presentation and the director/producer.

The whole is followed between paracentesis of the (time of the video ,of the language and if there are subtitles).

You will find in the texts the moment where the indication is (example: 01.22 means 1 min 22 seconds from the start of the reading) to allow you to go very quickly to what you are looking for and the important films are No. **2, 4**, 13, 17-18, and especially **22**

You will also find:

1. Highlighted the interesting points.
2. **in bold** the important point.
3. **In bold and red,** the very important points.

1.1983.MATRA film June.

This film was made in 1983 by MATRA for the Frensh Governement

From 1979 to 1983 we worked with Thomson CSF, Fort, MATRA and Etecma to design and **produce the first known Intra Oral Scanner (IOS) presented to the dental world at the congress**. It consisted of two cameras, one to capture the vestibular and occlusal surface and the other to capture the lingual and occlusal surface at the same time. These cameras used the **brand new CCD THX 31135** (288x208 pixels) from Thomson which we integrated in May 1981 in a special case dedicated to our dental application (image boards THX 5001, 5002 and 5003) and which was connected to the IOS by FORT optical fibers. Between 1981 and 1982, we developed dental software using the Euclid nucleus of Bézier/Matra Datavision. The connection with the numerical control ICN «synthesis» of the machine tool Etecma was made at the beginning of 1983 thanks to Mr Bernard of Grenoble. I was assisted by a young dentist from Grenoble, Christian Termoz, my uncle Bernard Duret and my wife Élisabeth.

2.Important 1983.Paris.Garancière.september. Frensh TV info 8 PM Antenna 2 « premiere »

This film was made by French television live and at a conference. **(OV with English subtitles):**

This is the **first presentation in the world (world first)** of a **complete dental CadCam system**, live and in congress, able to manufacture a crown adapted in its theoretical environment and using the 3 steps of modern dental CFAO (optical footprint, CAD and machining).

It was not carried out in a confined and uncontrollable environment of an R&D laboratory, but during a congress in September 1983 at the Paris VII dental faculty during the «9th Garancière interviews» room (Amphi B then A and Room 2e G). This presentation was the subject **of a live television broadcast on the television news of Antenne 2** the same evening (France) and of a worldwide dissemination of information (see press clippings and video 3). In front of more than 150 dentists and with the help of a model of feasibility (POC – Prouve Of Concept) of a dental CAD CAM system, **the extrados of a crown adapted to a theoretical and occlusion environment were performed**.

Was used separately :

1.An optical Print of an optical moiré preparation was **used our dual IOS camera** (vestibular and lingual) which we developed with the companies Fort and Thomson CSF,

2.A modeling of the surfaces of an intrados and an extrados of a crown in an upper and lower hemisphere in occlusion using a terminal communicating with Euclid volume CAD software, a dental version that we developed with Matra-Datavision and a Digital Equipment computer (Boston) located 15 km from Paris (**Ulis go Workflow**),

3.Machining the metal extrados with a Etecma milling machine 3-axis and its numerical control tool located in the faculty(**Ulis back Workflow**), that we had quickly adapted for dental machining in laboratory or office (change of tools by hand).

3.1983.Brazil. TV report. Garancière.

Example of a beautiful presentation from a Brasilian Friend (Tchao).

4.Important.1985.PARIS.ADF.November Frensh TV info 8 PM Antenna 2 « premiere »

This film was made by French television live and at a conference **(3 min, OV)**

This is the first presentation in the world **(world premiere)** of the realization in one session, directly **in mouth, live and congress**, of a crown adapted to its environment, in static occlusion and using the first known dental CAD CAM system. He already used the 3 steps of modern dental Cadam (optical footprint, CAD and machining). The whole Dental CAD CAM machine was present and connected in the conference room without external communication.

Hennson International and its President Jean Pierre Hennequin are responsible for this decisive step in the **history of dentistry**. This is the « *DURET system* » (Dental Unit for Restorativ Esthétic Teeth) from the international Hennson company. We also owe it to a high-level team led by exceptional Engineers, General Manager Gilles Deschelette, Technical Director Jean Louis Blouin, but also consultants more than brilliant and very high levels like Michel Théron (and Jean Claude Haas) from Matra Datavision or Jean Michel Decaudin (and Michel Lequime) from Bertin.

Always remember that without them, I couldn't have done anything.

This (successful) demonstration was not carried out in a confined and uncontrollable environment of an R&D laboratory, but at a congress in November 1985 during the international congress of the «Association Dentaire Française (ADF)» at the Palais des Congrès in Paris. It followed that of 1983, and was the subject, as in 1983, of a live television broadcast on the television news of Antenne 2 (France) and of a worldwide broadcast of information (see press clippings). In front of more than 600 dentists and using a CadCam system complete dental **(the first known and presented live on the stage of room** 53a then a&b) was **realized and sealed in mouth** a complete crown on Premolar adapted to its environment and occlusion.

Used separately

1.**An optical impression** of a profilometer phase preparation using a conical projection new IOS camera (and associated image processing) capable of taking 8 views and correlating them, developed with the company Bertin,

2.**a modeling of the surfaces** of a complete crown with cement space in an upper and lower hemiarcade in occlusion using a Digital Equipment Vax and a new version of a purely dental software using the heart of the Euclid volume CAD software, developed with Matra-Datavision

3.**The machining of a complete resin crown** (upper and lower surfaces) with a Kuhlmann 3-axis ½ CNC machine tool located in the room congress and developed for dental machining in the laboratory or in the office (change of 5 tools and automatic reversal).

5. 1985.from PARIS.ADF.december.Frensh TV info 7.30 PM FR3 Chambery

Same presentation with subtitles in English **(& Subtitle GB)**

6.1985.Chambery.SOSDS.December. Film SA.Hennson (6 min.). EO, PLY.occl. Fag&mv.MOCN.

This is the meeting of video images that were taken during a training congress for the ADF with Toulouse group of the CPSO on October 12, 1985 (to check the equipment before its transport to the ADF), of the ADF itself of 30 November and especially of image taken by AY television and regional television FR3 during the congress of the SOSDS of Chambéry (in France).

This last Congress (SOSDS of Chambery) **was undoubtedly the first congress in the world entirely devoted to Dental CAD CAM**, its peripherals (articulators, materials, spectrocolorimeters ..) but also to artificial intelligence and expert systems which was, for exemple, the subject of more than 3 hours of presentation by Jean Louis Blouin.

It was this SOSDS congress that became the ARIA Rhône-Alpes (hence its presence in Chambéry at the start for several years) before it moved to Lyon in the 2000s.

Apart from the already known images of fingerprinting, modeling and machining with the ADF Tools machine, we will especially note:

1.**modeling:** the first color shading representations that will become PLY (0.11 and 06.09 min)

2.**Optical Print of the Occlusion Optic Biter** (00.49 min) in phase-profilometry (very visible),

3.**Hennson Modeling Dental Soft**

a. Zoom effect (1.08) and **finish line trace** (01.12 min)

b. **Cement space calculation** and modelling (0-400 µm choice)

c.the "section" function (01.34 sec) with the measure and control function (01.40 min)

d. **static occlusion, contact point adaptation** (01.50 min)

e. surface deformations by action on knots (01.57 min)

f.the controlled function of intra-extrados adaptation by transparency (02.00 min)

g. Static occlusion (02.16 min)

h. **surface mesh surfaces (to become STL) not transparent** (02.26 min)

4. Dynamic Occlusion

a. Modelled FAG articulator

b. Positioning of the 2 modelled arcades in the GSW (in occlusion) (02.35 min)

c.Posterior Determinant Adjustment: Intercondyline, Slope and Benett (02.45 min)

d. Spatial movements in the software with calculation of the movements entered in 3D (02.50 min)

e.projection on the surfaces to be modelled for deformation (forthcoming)

5. machining

    a. Extrados (3.12 min)

    b. Intrados (04.12 min)

6.pose (seal) in the mouth (05.40 min)

7.1986.Lyon.Hennson. TV info FR3;question 3;February, « CadCam in Vienna »

This 23-minute television report was produced by frensh television FR3 as part of the "Question 3" series. **(23 min, VO)**

It is very interesting on the human level, because are present the real leaders of the Hennson Society and therefore of the dental CadCam in the world at the time. **We find there Jean Pierre Hennequin** (the President to whom dentistry owes a lot), **Gilles Deschelette** (undoubtedly one of the best GEO that I have known) and **Jean Louis Blouin** (a technical director of high quality). This team was still very close together. It will be until 1988.

Beyond the repetition of the demonstration of the ADF (made 2 months earlier), the interest is mainly the announcement of the release of the first **4 prototypes for cabinet during the summer of 1986 and the final commercial launch at the beginning of 1987**. Beyond Prototype No. 1 in my dental office, which was not in final design and will be operational between March and April (to june for Customer Service) 1986, these deadlines will be shifted by only a few months.

Reference is also made to **Dicor ceramics and Aristée composit.**

8.1986.TV Luxembourg.Coll.Odonto.Europe.mars.Journal info TV Luxembourg

This film was not made by French television but by Luxembourg television **(7 min.OV)**

This is a report presented at 20:00 (8:00 PM) on the Luxembourg television news during our live presentation at the municipal theatre for the European Odontological Congress on March 22

This is a condensed image of a few views from 1983 (Garancière), the repetition of the manipulation we had done at the ADF (proving the reality and reliability of the material) with Optical impression in phase-profilometry (very visible), surface modeling with a complete color shading arcade (future PLY) and tool paths with 3D machining of the Kuhlmann MO-CN that we had manufactured specially for our application.

9.1986.Marseille, JDM. May, live SEA Video, directed live **(x min,VO)**

Being digitized and restored to be transferred to a computer medium.

10.1986.Marseille, JDM. May, live SEA Video, late CadCam and early Spectro **(40 min.)**

11.1986.Marseille, JDM. May, follow-up live SEA Video, using the Spectrocolorimeter

One of my complete 1986 lectures of almost 4 hours was filmed and recorded live on Saturday 10 May 1986 at the Palais des congrès d'Aix Marseille during the « Journées Dentaires Marseille Cote d'Azur ».

Part 1 (film #10) is in digital editing.

This presentation includes the manipulation of the CadCam to realize a crown in mouth, occlusion and patient (with an optical mordu), but also the manipulation of the spectrocolorimeter that I developed with Bertin is accompanied by many questions live. It is a testament to what my interventions were in 1985-88.

We find in particular, the presentation of the definitive IOS of Hennson (projection in phase conical and sinusoidal profilometry, correlated multi views, cloud of points) Optical Impression steps, static and dynamic occlusion modeling steps and all machining with a 3D ½ machine tool (**Film #8**), answers to questions about Dental Cad Cam from dentist's and in particular the presentation of ceramic machining such as Dicor.

It follows **a live demonstration of the measurement of the tint of the teeth with the completely new spectrocolorimeter** that I developed with the company Bertin. It will be noted that its technique, software and HMI were extensively copied later without us being mentioned.

12.1986. N&B. 8611.plus minus Germany.

Film made by German television (not French) visible in Germany and Switzerland.

German television news in November 1986, filmed at the end of September 1986 in Vienna-Lyon (France) describing our work and following many articles throughout Europe: no one could ignore our work after september 1983 (see page « press » in this web page). One will notice the interview of the American dentist Omer Reed (Phoenix-Arizona) came specially to control our work. He siad he was a Altschuler college in 1973 in the Army Laboratory.

It is interesting to discover that serious to this television program (especially foreign and general public) the definitive system developed and marketed by the French company SA Hennson well completed and functional in mid-1986 thanks to Mrs G. Deschelette and JL Blouin.

This also proves that as early as 1986 the first complete dental CadCam system was not the CEREC (which machined only inlay intrados with a single view) as it is read too often, but our French Hennson system and that its commercialization was in launch. The CEREC system deserves our full respect, and this is not to criticize this very interesting system that I bought myself, but it is necessary to recall what everyone recognized at the time, namely that its "chairside" application was limited to copying the interior of a cavity with no occlusal surface (see film #23 "The CEREC at « the Yankee Dental Congress » on this site).

Apart from the proof by the public aspect of the issue, we see in action each of the components as they were marketed during 6 years: **the definitive Intra Oral Scanner** (IOS manufactured by Bertin) **finished and functional, the CAD and CAM software**, the **definitive tool machine Hennson** (manufactured by Lambert) and the **first tests of the heterogeneous and structured 3D fiber**

composite of the company Spad «Aristée» in its gray-blue proto support. For your information, the first system that was installed in a dental office was in a private dentist on the first floor of my office in Grand Lemps (France), next to my prosthetic laboratory. The goal was to test the Dental CadCam whole in **dental office and laboratory,** but above all the effectiveness of Bertin's new definitive IOS.

13.1987.Lyon.SUAV UFR Aix Marseille.aout.film Hennson publicitaire 88.

This film was made by Hennson as a sales support in Europe, the USA and Japan. **(17 min, OV)**

So this is the commercial version of the "Duret System" as we now call it. It went to the sales network. It is a document that engaged all the teams, including my own team. **It is a must-see testimony**. Part of it will be featured in the Australian film No. 16 of Beyond 2000 (You tube).

After a brief history of the denture, we find all the steps described above.

It is also clear that the Hennson system was designed for dentists and prosthetists: the IfoSupd prosthetic school under the direction of Mr Martinez-Dupuis had also launched **the first training center around CAD CAM and training cycle** in Lyon, Aix and Paris for prosthetists since 1987 with a book by Bruno Genty «treatise of dental morphology adapted to the EAO (Computer-assisted teaching).

At the same time, from 1986, **I launched, again as a world premiere, I believe, the first university courses on the CAD CAM** for the junior and sénior years (about 30 hours) and took the direction of the first DU (University Diploma of Biophysics Computer Science and Prosthetics or DU BIP) Postgraduate course. I was able to do so thanks to the friendly and unconditional support of the dean of the UFR d'Odontologie Aix Marseille, the great Professor **Raymond Sangiolo.**

The Hennson System is also the world's first prosthetic system.

On this mouvie (for student and congres) you can see :

1) Optical Impression with correlated multi-views and the optical mordu **in the mouth (dentist version) or model (prosthetic version)** with the trace of the finishing line,

2) modeling (CAD) with virtual dies-shaped models, automatic environment-setting using groove and cuspid lines, modifying grooves to respect antero-posterior and lateral dynamic displacements (static then dynamic occlusion with our Access Articulator or electronic facial arc that we designed to fit the occlusal determinants on the surfaces of theoretical teeth already deformed in the environment and in static occlusion). It ends with manual modifications (vestibular dome…)

3) Complete machining with automatic tool changes and their wear corrections (with route visualization). We also see the machining of the grooves to respect occlusion and occlusal movements and the control of movements during the undercarriage (which will be used in 1989 for the bridge inters)

4) External makeup and especially for the **first time in dentistry internal makeup** thanks to the fibers of lenses composing the Aristée that drives this new type of characterization from the inside to the outside. Subsequently we developed a kit of different cements.

A total of 12 successive operations.

14.1987.Lyon Vienne (France).SUAV UFR (17 min V GB).

This is the English version of the previous film to reach a wide audience (USA and Japan in particular)

15.1987.Lyon Vienne (France).SUAV UFR (17 min V germany)

This is the German version of the previous film to reach German dentists very fond of this type of technology in Europe.

16.1987.Australie. Lyon-Vienne, 1987, TV chanel 7 Beyond 2000 you tube

This film was totaly made by Australian TV Chanel 7. **(5.30 min VO and GB)**

Visit of the very popular scientific show and Amanda Keller in Vienne (France) in March 1987 following the launch of sales of the Hennson system.

Apart from the manufacture of occlusion crowns, which has become classic, we can visualize the theoretical tooth library (functional occlusal surface), the tools for correcting Bezier surface designs (STL and PLY of the time), the movement of tools in space (including the intrados and occlusal surface), the MO CN Henson in my 2nd office in Vienna and **the official presentation of the Aristée.**

What was Beyond 2000 serie ?

« Welcome to Beyond 2000, here we'll be making available the original ground-breaking series from the 1980s. Beyond 2000 was produced from 1985 to 1998, providing reports on cutting edge science and technology of the time. Beyond 2000 was in it's time a popular Australian science & technological innovation show/series with a host of reporters which ran for 1 hour on Channel 7 back in the 80's/90's. Beyond 2000 was originally called Towards 2000 on the ABC then changed to Beyond 2000 when Channel 7 bought the rights to the show. Channel 10 then took over the reins in the 90's but the ratings dropped not long after so it was canceled. Then in 2004/2005 Beyond 2000 made a bold return as Beyond Tomorrow once again on Channel 7.

17.1988.Chicago Midwinter. CDS.88.Impérial Ballroom et Ogden Room # 1

This film was totaly made by Michigan University without help of Hennson Inc. **(on live 60 min, V GB)**

This is the first live presentation of the Hennson material on North American soil **at the Michigan Dental University's Chircago Midwinter meeting**. Planned for 1,000 dentists (Imperial Balroom) approximately 5,000 dentists followed this presentation on 21 February 1988 (see « Press » 1988 congress &publication on my Web site).

The first part went well, but the fatigue (I had to speak for the first time in English), the questions too numerous for my very primary English (I had trouble understanding in the pressure of the conference) and the constant delay in presentation of the slides (my prosthetist/partner was still 1-2 minutes late???) ended up tiring me in the second hour.

The fact remains that this presentation was crucial and that **the equipment worked very well**.

In particular, it should be noted that:

At 05' 00 (5 minutes) the coating, occlusal **view with bitten and correlation spheres** for the first time. We had abandoned in 1986 the optical clay for the mordu (whose idea will be repeated in the Cerec in 2000), abandoned the correlation using the grooves and cuspids or 1 black dot on a white plane (because it was less precise than these spheres of 2.5 mm at the time- see patents) and re-adopted

the **use of the coating announced in 1982** to achieve a good contrast therefore a good accuracy (the new Chicago 512x512 CCD with its **250,000 pixels per view** allowed us to achieve in 16 views of the preparation and adjacent teeth the **impressive number of 4 million points**).

It will be taken in Chicago 9 views of the 3 teeth of the preparation : here image processing and correlation of 9 views x 250,000 pixels or 2, 250 million points! for 3 teeth against 125,000 points (versus a single view of a tooth in CEREC 1). To this it is necessary to add 2 views of the occlusal surface of the antagonists taken in relation centered through the intermediary of a bitten (It is noted that the antagonistic sight biter uses the same 3 spheres which allows us to be sure that the antagonistic teeth its well in relation centered on the preparation).

(A 15'00 min) is indicated by the dentist the reference points for the modeling software (bulge, contacts, groove and cuspids) that will allow the artificial intelligence software to build the future crown.

(A 20'00 min) we show that the software accepts only the cuspids valid for the occlusion (the expert system rejects any cuspid that is not part of the occlusion) then we draw the finishing line (with zoom). We also see here the difference between Cerec1 and the Hennson/duret system: the Cerec took only one view with parallel radiation while the Duret system could take up to 16 views of 3 to 4 teeth using a conical projection that the image processing software was able to correct (like the current projector videos). This explains why the tip of the Cerec 1 IOS was larger than the tip of the Hennson IOS.

(At 32'30 min) we demonstrate a precision close to 25 µm of our profilometry phase.

(A 37'30 min) we are talking about the revolution that dental CadCam brings to medicine (as was the case with anesthesia. Let us not forget that we are in the USA, cradle of anesthesia)

(At 45'00 min) trace and correction of the finishing line on a virtual die

(A 47'00 min) presentation of the cement space and the cement-free zone close to the finishing line (here 1 mm and 500 µm) and then at 55' visualization of the preparation on a virtual die.

(A 58'00 min) presentation of all theoretical teeth in the library.

(At 60'00 min), automatic environment adaptation.

18.1988.Chicago Midwinter. CDS.88.Imperial Ballroom and Ogden Room

(part #2, on live 55 min, V GB)

A 00' Occlusion: presentation of the 2 **Gnathological and functionalist libraries** (freely chosen by the dentist) but also memory centered on the occlusal surfaces of theoretical teeth.

(From 02'00 to 06'00 min) **this is the first presentation of the Access Articulator** and especially, on slides, the explanation of occlusal movements. I explain the deformation of the occlusal surfaces modelled in our surfacic modeling software according to the cuspid contacts/grooves between the crown and the opposing teeth, but also the modifications of the lateral and central grooves modelled on the theoretical teeth according to the antero-posterior and lateral movements that will give us our new electronic Facial Arc.

(A 06'30 to 08'00 min) **this is the first, in the world, presentation of the first Facial Arc connected to a CAD modeling system called the "Access Articulator" (or AA)** proto and explanation of its operation to find these elements in order to modify the occlusal surfaces of theoretical teeth.

(A 09'00 min) **Machine tool presentations** (to save time, it has already machined the lower surface during the creation of the upper surface), its 7+2 tools, its 4 axes and its wear or fracture controls.

(A 12'00 min) **presentation of Aristée, the first heterogeneous composite structured 3D fibre in the history of dental materials** and which was designed in our laboratory and that of Spad as an artificial tooth with 3D-oriented fibers, loads fixed on fibres which are silica but which may also be hydroxy apatite and magma acrylic polyurethane. He reacts like a tooth.

(At 14'30 min) **presentation also of Dicor as ceramic** for CadCam with its makeup (slides of different teeth)

(From 17'00 to 30'00 min) during machining the menu is presented which allows to customize the shape of the tooth (and theoretical teeth in memory **thus creating its own library**). A prosthetist can thus deform as he wants the tooth that is proposed to him in the automatic environment: we use the knots, we can go back, we modify the bulges, the general degree of wear and this by having the tool zoom and without resorting to the keyboard.

(At 37'00 min) before the end of the machining, the main issue is the price of the unit, a crown and the training time. The price of the unit is the same as the traditional method for 6 crowns a day in a cabinet and 10 in a laboratory. The training takes about 2 ½ days (was too optimistic even if we had a training center)

(At 43'00 min) I announce that I will present a new invention for makeup (see list of patents 1988) In Chicago this makeup will be made in a brilliant way (as usual!) in 4 minutes by Bernard Duret (46'00 to 49'00 min).

(49'00 to 55'00 min) **verification of the finishing line** before and after sealing: it is perfect!

19.1988.Paris-Dijon, Labo.Spad.Aristée presentation Marketing (4 min, VO)

This is the **first commercial mouvie** for Aristée material sales networks. This film was produced by Laboratoire Spad in Paris/Dijon in collaboration with Hennson, Bernard and François Duret during 1988.

We note in particular the composition of the Aristée: Composite heterogeneous like the tooth and multidirectional architectured with as basic component:

(A 00'40 min): 8 µm glass fibers in an acrylic polyurethane matrix.

(A 01' 10 min): like a tooth, good compressive strength on the occlusal face and shear on the finishing line thanks to good elasticity.

(At 03'00 min), we have an interesting point of view during machining and a nice analysis of the new concept of translucency for makeup.

20.1989.Berlin.8e Int.Symposium Quintessence on Ceramique.1e bridge au monde par Dental CAD CAM (movie not finish yet VO 60 min).

This film is part of the base of the 40-minute long version that I used for the Berlin presentation. This **is the world's first achievement of a bridge by CAD CAM** presented as part of the «8^{e} International

Symposium on Ceramics» organized in Berlin by Quintessence on Sunday, September 10. It was made between May and June 1989 and was edited in July before I left for University Southern California.

I am looking for the final version presented starting with the optical print (which had been made on model) until the end of the machining. This version will replace this rather interesting passage, which does not show the beginning and the end of the process.

21.1990.Singapore.78e FDI & Int Congress of Academy Gnathology : Acess Articulator screen (AA) (not finish yet.on live, 20 min approx.)

This film is the entire recording that was used for about 20 minutes* and that served me for the presentation of Singapore at the 78th FDI congress where I was key speaker in 3 sessions and in the «Iinternational congress of the Académy of Gnathology».

Access Articulator (AA) was completed and 3 prototypes were produced and placed in the hands of dental specialists (I have one in my CAD CAM museum).

This is the screen view of the AA showing the 2D and 3D motion recordings before their transfer into the Hennson Duret System modeling software so that the occlusal surface is not only respectful of static occlusal contacts (see film 22 of Strasbourg as an example of static adaptation), but also dynamic movements.

*This film is still raw and will be reduced as it was done directly in the conference room at the time (we stopped and then we started the portable Sony VCR by having spotted the counter numbers!).

22.Very important movie.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, one for laboratories (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) and the other integrated in the dental office 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. **Step 1:** (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. **Step 2**: 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'Amérian 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.

1990.USA.Cerec.Yankee dental congress. Moerman-Brandestini (on live 3.10 min V GB)

This is a presentation of what the CEREC system did in 1990 and compare it to the performance of the Duret system from Hennson International. His vision is therefore to be compared with the film made in Strasbourg the same year **(movie 22)**

Note the following important points announced by W Moerman himself:

1. « my clinical experience dates from 1985. I made my first Inlay «CEREC» in September 1985 »

2.Single view, square projection B&W (not sinusoidal) and parallel (single tooth). Manual depth of field adjustment (00.35 to 00.50 min). Adjustment of three horizontal surfaces: occlusal 2D edge, contact point 2D and lower part of the cavity (01.05 min)

3.Tool path in 1D ½ axes (rotation advances in regular steps). A single 2.5 cm disc-shaped tool driven by a water mill that can lubricate the ceramic (slide: an inlay that I made in 1988 with my Cerec).

4.The precision was given at 150-300 µm at the time (02.00 min) and required correction. The occlusal surface was made by hand in the patient's mouth (sic W Moerman 02.45 min).

There was an interesting application for the Veneer identical to the Inlay application that I did not attach to this film. Hennson's System Duret did not have a Veneer facet application at this time. It cost 60,000 Swiss francs (30,000 euros discounted 2020).

This system was very easy to handle in and between dental offices. A pure and friendly Chairside .

24.1991.Los Angeles.ADA.May. "dentistry update" at USC with Dugoni and Preston (7 min V GB)

Probably one of my worst professional memories, I had not been warned and when USC was unable to find someone to use our Hennson system, I was called urgently … and we were filmed in my first-floor lab at USC. 00.11' presentation of the model with spheres, wax occlusion and blue coating.

A 00.12' different shots (10 to 12 views) and indications of the decisive points on the video view

A 00.14' automatic modeling and environment

At 00.15' Aristée machining with a **beautiful occlusal surface**.

(In passing this evenement, I must specify : Pr Dugoni is for me a marvellous « souvenir » in and from USA and in private J Preston and his wife Charlotte, was very friendly)

25.1992.Los Angeles (USA) Labo Sopha Bioconcept.film US (3 min, V GB)

This film was made in the demonstration laboratory on Olympic Bvd (LA) from the American subsidiary of the French company SA Sopha Bioconcept of the Sopha Medical group in order to spread our system in the USA. It is an American realization made in Hollywood studios (by the handsome son of my great friend and GEO JC Haas). It will recognize PhD Dr Jerry Mc Laugling at the controls of the device.

This film is interesting because **it represents the second generation of the « Duret Système » developed by Sopha Bioconcept,** under the new name of « Sopha Cad Cam » after it bought the SA Hennson middle 1991 then in financial difficulty. Sopha Medical which was a company manufacturing heavy equipment for Radiologists (and its 800 people) did not have much more chance than Hennson, because 2 years after its takeover it will also disappear **leading in its fall in 1993 its dental subsidiary Sopha Bioconcept (ex-Hennson International), its 35 employees and our CAD CAM system**.

We often talk about the CAD CAM of Sopha instead of Hennson, but it should be noted that Sopha Bioconcept did not do much in the history of dental CAD CAM. **While Hennson started from scratch** and had almost everything built in 8 years (from 1984 to 1991) **Sopha Bioconcept existed barely 2**

years and only re-designed the exterior of the devices developed by Hennson, as can be seen in this film.

From 00 to 00.60 min we see **the «opticast» support** which is only a tripod for prosthetists supporting the Hennson camera and its image processing unchanged.

From 01.00 min to 01' 55 we see **the program "Biocad"** totally identical to Hennson's program (internal, framing, modeling occlusion). The only difference is moving the cement space from step 1 to step 5, which is not very clever, isolating the "back to the initial tooth" menu and developing a coping menu for prosthetists !! This marketing error opened up a boulevard in the Cerec 2 system that focused on inlays and crowns for dentists, which Hennson was about to do !!!

From 01:58 min we see a **"DMS" machine tool** that looks like a "tank" and looks very different. Actually, it's just an external overhaul of the Hennson machine. Only one clever change: the tools support (from the tool holder disk we moved to an online support to keep the tools in fixed position). For information, the change of the «Kavo» brooch to «Precise» brooch (seen in the film) had been finalized in the last machines of Hennson.

As for the materials, nothing special except that in addition to the Dicor ceramics presented in Chicago and Aix **(film 10, 11 and 18) appeared the EmPress ceramics of Ivoclar** and, unfortunately, the abandonment of Aristée for Aurelie, a poor copy of Aristée , made without imagination just for financial matters.

End of digitized films in 2020. To follow.