ADDENDA FOR FRANCOIS DURET WORKSHOP - December 5-6, 1986

During the NAPILI 6, 9-20 January '86, we had the privilege of attending the International Dental Convention in Courchevel, France. . . a gorgeous place. . . the weather was beautiful, the skiing was fantastic, and the particularly pointed discussion, technologically, again underscored the transitional period in which we find ourselves.

I report to you the following events with great enthusiasm, as I've been there, first-hand, and feel that they are the cutting edge of the new technology in our profession, reflecting the experiences we'll enjoy for the next 15 years or so. Roy Hammond and I took time to leave the slopes and travel to Lyon to visit with a major international electronics firm (HENNSON), its Director General, Gilles Dechelette, and a dentist, Francois Duret. Dr. Duret has, for the past 15 years, been working to perfect a laser scanner/computer combination that will drive a micro-milling machine to produce dental prosthetic products more rapidly, more efficiently, more accurately and with a higher quality of material characteristics.

We were literally astounded as the entire process unfolded before our eyes! We watched on closed circuit video as Dr. Duret prepared a lower bicuspid on his wife, scanned the preparation with the laser scanner and put a block of Dicor in the micro-milling machine and, with the computer imagining that had been accomplished by the scanner, the micro-milling machine did the occlusal surface, the occlusal half of the crown, flopped the block over and milled out the intaglio; then did the gingival half of the crown including the razor-sharp margins. Fifty minutes after his wife entered the dental chair, she left, smiling, with a color-matched Dicor single crown that fit within three-thousandths, was bonded to the tooth, was properly shaded. She had neither an impression nor a temporary, and no one even wrote a lab scrip.

We are living in a new world.

Dr. Duret's remarkable assemblage can do inlays, onlays, three-quarter crowns, full crowns, three-unit bridges and full upper or lower dentures, milled out of solid block, fitting the person immediately. He has a computer-recording apparatus for tempero-mandibular joint and function. The memory bank can complete the morphology of the individual tooth if it's been damaged severely; or the scanning prior to prep can reproduce the existing tooth's morphology exactly, including facets and/or whatever you choose to include. The post dam on the denture is entered with the keyboard and/or is taken out of the computer's memory bank. The crowns can be fabricated out of gold, composite, non-precious, or Dicor. Some of the new composites that are factory-fabricated, not laboratory-processed, will be introduced, even, perhaps, some of the carbon-fiber materials. We're in for a new world in prosthetics materials.

Dr. Duret projects that these tools will be available in late 1986, early 1987. . . the investment is expected to be somewhere between $15-20,000 -- a pittance for what I believe it can do. I've calculated that many of the people who come to me to have their crowns seated actually find it to be more expensive to leave their work and make the second visit than the crown itself costs, totally. So, we're talking about a parameter of time and quality for people that may be remarkably important to some.

The following two articles were sent to us by HENNSON and were translated, and are reproduced, as received:

INDUSTRIAL AND COMMERCIAL STATE

1) What is CAD/CAM? As its name indicates, the Computer Aid Design and Computer Aid Manufacture (CAD/CAM) is a process which consists in using the modern computer power for a wide automation of the manufacturing process.

Almost non-existent fifteen years ago, the CAD/CAM market passed the two billion dollars with an annual growth over 35%, it will be about 20 billion dollars in 1990.

The CAD/CAM evolution has several common points with the computerized management evolution which is very close as regards to technique and strategy point of view.

2) How did CAD/CAM take form in the dental field? From 1971, a young dentist surgeon of Grenoble, Dr. Francois Duret, imagined the computer would enable the specialists to design and manufacture automatically dentures of high quality, so quickly that in a single visit the dentist could perform the design, the shape and the fitting of a prosthesis.

But for this, the machine had to be equipped with an "eye" so that it could see in relief in the patient's mouth and with a mechanical instrument immediately ensuring the manufacture of the prosthesis under its control.

For twelve years Dr. Duret, who has a wide science education, worked with different colleagues to elaborate a process of three-dimensional optical imprint and to conceive a dental CAD/CAM process. In 1983, he presented the results of his work to the Dental Profession during the Garanciere Dental Surgery meeting in Paris.

3) What is Dental CAD/CAM? The innovation consists in using the CAD/CAM for the design and the manufacture of dentures.

The actual method of design and manufacture of dental prosthesis has the disadvantage of being lengthy and expensive. This method used for over 300 years has not received any fundamental modifications in its operation. It includes the following steps:

a) taking of casts in the mouth with elastic paste at the dentist's office,

b) sending of this cast to the dental laboratory technician who manufactures a mould and moulds the prosthesis following the method called "lost wax",

c) testing and modifications of the prosthesis at the dentist's office (sometimes numerous and unpleasant).

The new process combines a method of optical imprint-taking with a

ON NOVEMBER 30, 1985, AT THE INTERNATIONAL CONGRESS OF THE FRENCH DENTAL ASSOCIATION, DR. FRANCOIS DURET WILL PRESENT A WORLD PREMIERE, THE MANUFACTURE OF A DENTAL CROWN WITH AN OPTICAL IMPRINT ON A PATIENT, FOLLOWED BY THE DESIGN AND THE MANUFACTURE ASSISTED BY COMPUTER OF A PROSTHESIS.

5) State of the commercial development? The launching of the manufacture of the first production equipment is planned in the second half of 1986, because before the apparatus will be subjected to an extensive clinical testing.

This demand comes from two different sources:

. . . the one coming from French and foreign specialists and dental mechanics wishing to equip themselves. It is more and more urgent with the development.

. . . the other one which comes from large industrial and commercial companies involved in the industrial dental market. They wish to have exclusive distribution or even manufacture for the product rights. Negotiations are in progress.

6) Cost of the equipment? Notably, there will be more than one model of apparatus on the market, but there will be several possible configurations, for instance, several specialists working in the same surgery can equip each of their operating theatre with an apparatus of optical imprint-taking, connecting them to a single manufacturing machine.

The price of the various configurations varies from 150,000 to 500,000 FF (tax free) but to be realistic, one must compare its cost of depreciation and use with the actual cost of purchase of prosthesis. For many dental surgeries, it will be immediately profitable, the more so because the dentures are feasible within a single visit.

7) Compositions for the prosthesis? Many people thought that since the apparatus manufactures the prosthesis by machining it could only make metallic dentures. It is not the case, and for a long time Dr. Duret and his team have worked on the manufacturing of much more esthetic materials such as composites and ceramics.

Actually, it is undeniable that these esthetic materials will come into general use, for today, what makes the high price of the so made prosthesis is much more the cost of the actual manufacturing process than the material cost.

The CAD/CAM fundamentally changes these facts.

Today, thanks to the lightning development of the composite materials such as ceramics, we can envisage the production of high quality mechanical and esthetic prosthesis.

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## HISTORY

For the first time a crown will be created and fitted in a single sitting inside the "Palais des Congres". It is on his wife that Dr. Duret, the

Actually, if the last two ones only make an analysis of the organs and visualize them, the CAD/CAM goes on to carry out an automatic diagnosis and therapeutic treatment.

. . . in spite of this, the specialist retains full capability to intervene and make best use of his knowledge. We can see it is the first complete medical system combining diagnosis and therapy.

It is a CAD/CAM process combined with the artificial vision which can be directly used in everyday life, everyone can benefit from it at any time of his life.

This demonstration shows, once more, if it were necessary, the high quality of the care and the research in an area often overlooked: the French Dental Surgery.

We can only be proud to state that a dentist is at the origin of anaesthetic and again a dentist is at the origin of the Medical CAD/CAM.

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## DENTAL PROSTHETICS FABRICATED BY COMPUTER

A process absolutely revolutionary, allowing fixed prosthesis to be fabricated in less than one hour without impresions, models or temporization has been publickly demonstrated for the French Dental Association at its Paris meeting.

On his wife, Elizabeth, the French dentist, Francois Duret, a dental surgeon from Grenoble, inventor of the CFAO (Conception and Manufacturing attended by Computer) prosthetic appliances, has produced, with the first protypical equipment, a crown for a posterior tooth without any manual operation.

He is able to do crowns, inlays, onlays, and three-unit bridges as well as full dentures. There are three machines connected in this system. . . a camera that takes the print from the patient's mouth, thanks to the laser scanner technology; a computer converts automatically this view into numerical givens and reconstitutes a graphism of the preparation for the production tool, or the micro-milling machine to fabricate the prosthetics out of either composite metal or ceramics. The sophisticated equipment produced by Lyons' enterprising HENNSON firm has a total cost of about 500,000 francs and is being rapidly sought after, internationally, by over 655 of the dental laboratories that have been exposed to it.

Dr. Duret projects that its lease/sale should amortize itself in a five-year period; at least in most offices.

Dr. Duret's wife enjoyed having her tooth placed permanently in her mouth within 50 minutes of the time that he began the preparation without the tooth having had an impression, without it being temporized or without her having to come back for a second visit to receive the crown.

(News Release, L'Est Republicain, 5 bis, avenue Fech, 54042 Nancy Cedex, 24 December 1985.)

NAPILI INTERNATIONAL

NEW DIRECTIONS IN DENTISTRY

AT LAST. . . .

NAPILI is pleased and fortunate to offer a two-day workshop featuring Dr. Omer K. Reed and DR. FRANCOIS DURET, representing the Hennson Corporation of Lyons, France, on the subject of:

**MICRO-MILLING MACHINE LASER/COMPUTER-PRODUCED CROWNS, DENTURE BASES AND GENERAL PROSTHETICS IN DENTISTRY.**

Dr. Duret will demonstrate, through use of video tape, slides and lecturing, THE LASER SCANNER, COMPUTER DRIVEN MICRO-MILLING SYSTEM OF FABRICATING CROWNS, using Digital Equipment Company (DEC) mini-computers to digitalize the laser-scanned preparations and to fabricate dies or crowns for single-sitting procedures. Composite, Dicor,(and quite possibly other more exotic materials) will be used in these fabrications.

This means that a slightly elongated single visit by the person coming for care would be more useful, both in an economic sense and in a social sense. The frontier of placing a superior prosthetic appliance without having taken an impression, writing a lab prescription, or placing a temporary, is an exciting concept. Dr. Duret will be available for questions and answers; the dialogue will be brisk. We believe that the process will be the BEGINNING of a new armamentarium in dentistry and it will be fun to be in on the ground floor.

Enclosed is our original copy announcing this phenomenon for your study and as a reminder of our initial enthusiasm after having seen Dr. Duret and his technology while in Lyons in January, 1986.

Calculations show that many of the people coming for our care invest more in their second visit by taking time from their work, coming to the office; then going back to their office and "spooling up" again than the investment in the actual crown.

This two-day workshop is, we believe, a break-through in communication and technology, certainly the beginning of a NEW and GOLDEN AGE in dentistry. You will leave with a new enthusiasm for our profession and a working knowledge of a new technology.

Dr. Duret will speak about when the hardware will be available, what the cost and investment will be, what the general maintenance and upkeep is expected to be. He has a unit presently in use in a general practice in

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Lyons, which was demonstrated at the national meeting in Paris. Dr. Duret has been working on this project for 15 years; this is the culmination of his many years of effort.

In Phoenix, we have a friend who has a "machine shop" micro-milling business very similar to what Dr. Duret is doing, making milled parts out of titanium for the space age companies for whom he contracts. He has had laser scanners and this kind of technology for the past 15 years, so it's not new to the world, just new to dentistry. We're impressed and pleased with the efficiency, the productivity, the lack of remake and the excellency and accuracy that comes from this technology. We're certain this is just the beginning and that there will be many improvements and much expansion on the idea system, once the Hennson company has its limited partners in place and manufacturing and delivery begins.

OME, JOIN US for this workshop. Pre-registration is mandatory. This is a limited attendance workshop. Your check, in full, is your registration ommitment.

DATE: 5-6 December 86

PLACE: HILTON HOTEL, Avenue of the Americas, New York City
1-800-HILTON, for reservations. Identify with NAPILI, Dr. Francois Duret meeting.