

Dental Research News

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Make Things Happen

We should aim to keep up with the research literature, we should conduct research to answer questions about the unknown, and we should apply the results of these studies to our teaching and clinical practice. As university faculty members we cannot afford to belong to a group that have no idea what is happening or a group that simply watch things happen. As pointed out by Ralph Crawford in the April edition of the Journal of the Canadian Dental Association; quoting Carl Miller former executive editor of the Wall Street Journal.

"There are three kinds of people, those who make things happen, those who watch things happen and those who have no idea of what is happening".

CDA Standards for

Canadian Dental Materials

The committee on Dental Materials and Devices of the Canadian Dental Association have initiated a new recognition programme for dental materials. Dental products which have submitted proof that they meet required standards which will be either; National CSA or International ISO standards. The committee have worked for many years to develop a workable dental standards system in Canada. Once analysis of documentation and proof of compliance has been approved by the CDA committee a "Seal of Recognition" will be issued and the manufacturer will be able to use this in any advertising or promotional material. The programme may well stimulate some industrial sponsored bio-materials research for Dalhousie University.

1988-89 Dental Research PAPERS, BY SUBJECT.

The percentage distribution of papers for the 1988-89 IADR and AADR meetings by subject area are shown in the table below. The largest sections are as usual Dental Materials and Periodontal Research. Microbiology/-Immunology are the next largest group followed by Craniofacial Biology and Behavioral Science.

SUBJECT	AADR		IADR	
	89	89	89	88
Behav. Sci..	7.0	6.1	4.2	
Cariology	5.0	6.6	6.3	
Cranio. Biol.	7.0	5.8	6.6	
Dent Materials	18.5	15.0	17.0	
Diagnostic Syst.	2.7	1.7	2.0	
Exp. Path.	5.3	3.9	3.8	
Geriatric.	1.7	1.9	1.1	
Implant.	2.6	2.6	3.1	
Micro/Imm.	8.9	9.5	8.4	
Min. Tissue	4.9	6.6	7.4	
Neur/TMJ	4.2	4.0	3.7	
Oral & Max.	3.3	1.9	2.9	
Perio	14.1	17.0	16.0	
Phar.Ther.Tox.	4.3	3.2	4.3	
Prosth.	3.9	5.8	5.6	
Pulp Biology	2.8	2.8	3.5	
Saliva	3.6	5.5	3.1	

The above papers represent a total of 5,519 abstracts for the three international dental meetings. At the 1988 IADR meeting we had 2,362 papers, at the 1989 AADR meeting we had 1890 papers and at the 1989 IADR meeting there will be a further 1262 papers. It should be noted that in Dublin it will be the first IADR meeting in which we have had more Periodontal Group papers

presented(216) than the Dental Materials Group papers(190). This is in spite of the fact that we have John Sterrett presenting his paper in the dental materials group programme. However, the totals of papers for these two groups at the 1989 AADR San Francisco meeting were 341 for dental materials and 260 for the periodontal group. The combined 1989 totals for the two meetings are thus 531 for dental materials and 476 for the periodontal group.

Dental Faculty Objective

"An appreciation of, and interest in research must be fostered. To this end an opportunity must be provided for students to be made aware of research activity by direct contact with those conducting projects, and also by affording the opportunity for interested students to do research work". [One of the objectives approved by the Faculty of Dentistry Dalhousie University on February 27th, 1961].

Joint Funding

The President of the Medical Research Council of Canada, Dr. Pierre Bois, said recently that MRC are considering the possibility of jointly funding some projects with other agencies.

446 Years of PROGRESS

- 1543 Vesalius published the first modern textbook of descriptive anatomy.
- 1561 Gabrielle Fillopio was the first to take a close look at the anatomy of a woman.
- 1600 Girolamo Fabrizi founded the modern science of embryology.
- 1628 William Harvey described the circulation of the blood
- 1661 Marcello Malpighi discovered how oxygen enters and leaves the bloodstream.
- 1670 Jan Swammerdam showed how muscles work.
- 1680 Clopton Havers noted the microscopic onion-ring structure which gives bones their strength.
- 1707 John Floyer the first to time the pulse rate.
- 1733 Stephen Hales measured blood pressure and flow.
- 1741 Carl Linnaeus introduced the concise method of using two Latin words to describe each species.
- 1757 Albrecht Von Haller by extensive experimentation built up the picture of the nervous system.
- 1774 Alexis Duchateau made the first set of porcelain dentures.
- 1775 Antoine Lavoisier discovered that oxygen is inhaled and that carbon dioxide is exhaled.
- 1775 Percival Pott was the first to recognize occupational disease.
- 1791 Luigi Galvani demonstrated that electricity could cause muscular action.
- 1793 Thomas Young showed how a muscle focuses the lens of the eye.
- 1796 Edward Jenner developed vaccination.
- 1806 Giuseppangelo Fonzi produced the first individual porcelain denture teeth.
- 1811 Charles Bell published "Idea of a New Anatomy of the Brain".
- 1821 Francois Magendie published formulary for the preparation and use of several new drugs.
- 1825 William Beaumont peered into a living stomach.
- 1825 Dental Amalgam was introduced
- 1827 Karl Von Baer was the first to see the human egg cell.
- 1838 Robert Remak was able to report on the microstructure of the nervous system.
- 1839 Theodor Schwann identified, the cell as the basic unit of life.

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PROGRESS (Cont. form p. 3)

- 1840-50 The "First Dental Amalgam War" took place
- 1843 Emil du Bois Reymond showed the electric nature of nerve transmissions.
- 1844 Horace Wells introduced the idea of Nitrous Oxide as an anaesthetic for tooth extraction.
- 1844 Karl Ludwig identified the filtering action of the Kidneys.
- 1847 James Young Simpson introduced the use of chloroform as an anaesthetic.
- 1851 Karl Ludwig associated action of saliva gland with nerve stimulation.
- 1855 Thomas Addison proved the importance of hormones.
- 1857 Claude Bernard identified the liver as the storehouse of energy-producing sugars.
- 1858 Charles Darwin published his "On Origin of Species by Means of Natural Selection."
- 1859 Vulcanite invented by Goodyear, developed as a denture base
- 1861 Pierre Paul Broca located the speech control area within the brain.
- 1864 Dental porcelain crown came into general use.
- 1865 Gregor Mendel discovered the medianism of inheritance.
- 1873 Beers developed the first dental gold shell crown.
- 1882 Herbst developed dental ceramic inlays.
- 1884 First single-tooth porcelain restoration was introduced.
- 1890 Zinc Phosphate Cement developed.
- 1900 Lost Wax Casting Method introduced to dentistry.
- 1908 The Maritime Dental College was founded in Halifax.**
- 1910 Fickes published the earliest mechanical properties of dental materials.
- 1912 Silicate cement was invented.
- 1918 First chemical analysis of dental Porcelain.
- 1919 Stainless Steel invented.
- 1921 Frederick Banting and Charles Best discovered sugar-controlling insulin in the pancreas.
- 1929 Werner Forssmann passed a catheter into his own heart.
- 1929 Cobalt Chromium Base Alloy invented.
- 1935 Acrylic Resin developed as a denture base material.
- 1931 The SEM was invented.
- 1945 Advantages of fluoridation of water recognized.
- 1947 Geoffrey Harris analyzed the brain's chemical messenger system.

Continued on page 5.

PROGRESS (Cont. form p. 4)

- 1953 Crick and Watson discovered the DNA structure.
- 1954 James Olds discovered "the pleasure areas" of the brain.
- 1957 James Gowans discovered the circulation of disease-fighting cells from the lymph nodes. defences against attack.
- 1955 Acid Etched of Dental tooth Enamel introduced.
- 1956 Dental Porcelain Fused to Gold methods introduced.
- 1957 Bis GMA and Composite Resins developed.
- 1959 The new Dental building was officially opened.
- 1959 Dr. A.E (Sandy) Hoffman, of Dalhousie Dental Faculty was awarded an NRC Research grant for \$2,350.
- 1960 Polysulphide Impression Material invented.
- 1961 Jacques Miller showed that the thymus gland musters the body's defences against attack.
- 1961 Dr.J.Findlay of Dalhousie University, Dental Faculty was awarded an NRC Research grant.
- 1963 Dental Air Turbine Handpiece introduced.
- 1963 High Copper Amalgam invented in Canada.
- 1965 Silicone Impression Material invented.
- 1965 Dental Aluminous Porcelain invented by J.W.McLean.
- 1968 Dental Zinc Polycarboxylate Cement invented by D.C.Smith..
- 1970 Dental Porcelain Fused to Base Metal introduced.
- 1971 Solution developed to dissolve dental caries
- 1972 Glass Ionomer Cement invented by A.Wilson.
- 1973 Urethane Dimethacrylate introduced.
- 1974 White Light Photopolymerizing invented.
- 1980-89? The Second Amalgam War!
- 1981 Phosphorus Ester/diacrylate (dentine resin adhesive) introduced.
- 1981 Herbert Waite isolated and characterized the polyphenolic adhesive from mollusks.
- 1982 Dental Posterior Composites (second generation) introduced.
- 1983 Cloning of the mouse gene that codes for one of the proteins of tooth enamel.
- 1984 Dental Cermet Material (silver/glass-ionomer) invented by J.W.McLean.
- 1987 Dental research Development Office set up at Dalhousie. Ist Dental Research News published.

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PROGRESS (Cont. form p. 5)

- 1987 Record number of Dalhousie Faculty & students involved in summer research.
- 1988 Record number of Dalhousie papers at IADR meeting.
- 1988 Record high research funding for the Dalhousie Faculty of Dentistry from MRC.
- 1989 The Faculty of Dentistry at Dalhousie passed the 100 mark(113) for papers (Abstracts) presented at international dental meetings (a total of 56 during 1988-89)

VOICE FROM THE FORREST

At the Annual Meeting of Dalhousie University Faculty of Dentistry held in the Munro room in the Forrest Building on Wednesday., May 11th, 1955, Dean J.D. McLean reported that one of the priorities and needs of the University was the establishment of a Department of Dental Research.

OPEN WIDE

Thirty years ago on September 25th, 1959 the 1st new Dental Building was officially opened.

Research Award

Thirty years ago at the Annual meeting of the Faculty of Dentistry on May 8th, 1959, it was reported that an NRC grant

of \$2,350 had been awarded to Dr. A.E. Hoffman to undertake research activities in the faculty. A third year student, Michell Levine was also awarded a summer research assistantship to work with Dr. Hoffman. In 1961 Dr. A.E. Hoffman reported to the faculty that he had been investigating bone grafts following mandibular resection in the rat, using anorganic bone. The results had not been gratifying and the original investigator of this procedure had also recently suggested that results with the technique were not as encouraging as he had originally been reported.

Perio Research

In 1961 the late Dr. J. Findlay was awarded an NRC National Research Council Grant . His research project involved an investigation of the gingivitis produced by the removal of the anterior pituitary in the rat, and the effect of hormone replacement and withdrawal in the gingivitis thus produced.

Chicken-Egg Cycle.

"Since theories encourage the acquisition of new data, and data the generation of theories- as surely as hens engender eggs, and eggs hens- scientific discovery can enter the cycle of scientific activity at any point."

Langley et al.

Toronto Research Meeting

It was reported to the faculty meeting on November 1st, 1961 that Dr. Findlay and Dr. Hoffman had attended a research meeting in Toronto.

Dr J. Findlay reported that many interesting papers were read.

There was a general feeling that nothing of great significance was likely to come out of any one paper, however, in the discussions much useful information was exchanged.

There was said to be an increased awareness of the need for such meetings periodically to prevent duplication of research effort and to allow for cooperation in those projects being conducted.

The desirability of appointing a full time research faculty member to each existing dental faculty, using the funds that are now available, was stressed. It was pointed out that the University of Toronto was the only dental faculty with such an appointment.

The Toronto meeting had concluded that the most productive and useful research was being done by individuals with no other commitments. The stimulus that such a worker provides to the student body and the faculty was said to be exceedingly useful.

Council on Dental Research of C.D.A.

Dr.A.E. Hoffman reported on this meeting, which was held following the Toronto research meeting, in the fall of 1961.

Dr. Findlay's paper was well received by the research meeting and invoked much interest and discussion.

It was noted that a full time research worker with dental training is not easily procured, but the meeting felt that an individual trained in the basic sciences and interested in any one of these fields is just as good. At the Council meeting, Dr. Hoffman said he was interested to learn that the C.D.A. is the only National body which gives financial assistance to research.

The C.D.A. was reported to have supported twenty-four graduate dentists for further training in research or teaching, of these, twenty were said to be now affiliated with dental schools. A further Twenty-nine student-ships were said to have been provided and of these, five were of dental faculty members and a further ten were students attending dental schools.

The possibility of establishing a Canadian Association for Dental Research, following the American plan, was discussed.

Research Students

In 1961 NRC Research summer studentships were awarded to three Dalhousie dental students, Paul, Logue, and Robinson.

Connaught agrees to joint French suitor

A top Canadian drug company has accepted an offer to join forces with the pharmaceutical arm of a giant French corporation. Connaught BioSciences Ltd. said yesterday it agreed to the merger proposal by Institut Merieux S.A. of Lyon because the venture will increase Connaught's research base and access to European markets, and help in bringing new products to the North American market.

The new company, to be called Merieux-Connaught N.V. will have revenue of more than \$500 million and a research budget of about \$80 million based on 1988 financial results, the parent firms said in a joint statement.

The deal still needs the approval of Connaught and Merieux shareholders. Investment Canada and tax authorities in Canada and France. The pact was proposed by Merieux a week ago and signed by the two companies in April

Connaught started as a division of the University of Toronto and became the first laboratory to introduce insulin commercially in 1922. Today, the company produces vaccines and blood plasma. It is not clear how the proposed new link with Merieux will affect research investment in Canadian universities by Connaught

Biotechnology

Porton International a UK based biotechnology company is being backed by \$152 million from financial institutions. The main research development programme has a number projects of which 6 to 8 might produce significant production in the 1990's. High hopes are for a vaccine or drug for herpes; a drug for treating muscle disorders and a diagnostic kit for monitoring potassium in the blood stream. Potassium can indicate a range of diseases. In 1987, the company made a \$13.4 pretax profit.

Reasoning

"To understand and evaluate scientific reasoning you do not have to become a specialist in probability theory any more than you have to become a specialist in any particular science". R.N. Giere.

New drug for Alzheimer's.
A series of new drugs designed to restore memory, learning and understanding in people afflicted with Alzheimer's disease were announced at the Royal Society of Chemistry's annual meeting, at Hull University UK. The first trials on humans were said to be expected within three years. Details of a new family of man-made components known as "cholinergic agonists" were outlined by Dr. Raymond Baker, director of medicinal chemistry, of the Neuroscience Research Centre, of the Merck, Sharp and Dohme company.

The discovery should provide a new type of drug that avoids the hazardous side-effects associated with attempts to modify known nerve agents for treating failing memory. A warning of the risks of an experimental under test and based on a nerve agent, called tetrahydroamino-acridine, or THA, is contained in the current issue of the British Medical Journal.

The development of both THA and the new cholinergic agonists depends on the reasoning that the loss of memory and other faculties are caused by a deficiency of chemical messengers in the brain, and in particular, one known as acetylcholine.

The loss of essential chemical messengers for the brain

among sufferers of Alzheimer's, was established by analysis of tissue.

But direct replacement by injecting into the blood a drug containing the natural chemical messenger is out of the question because the biochemistry of the molecule prevents it from crossing the so-called blood-brain barrier, which filters out most of the damaging substances that might poison the brain.

The loss of the chemical messengers is not simply a fault in production by the body. In the healthy brain, the concentration is regulated by the presence of other substances that are chemical enzymes. With THA treatment, the idea is to stop the enzymes destroying the few chemical messengers that are produced. The man-made agonists, on the other hand, are designed to mimic the action of the main natural chemical messenger and to be able to cross the blood-brain barrier.

Once the drug reaches the appropriate parts of the brain, the cortex and the hippocampus, the man-made molecules are designed to lock on to and stimulate a specific type cells which, Dr. Baker says, "then triggers a cascade of processes that turn on memory, understanding and learning".

British Universities May Go for Private Cash

A report from the UK indicates that Government funding to Universities might in future be channelled to universities in proportion of how much each university raised from private sources, including industry. The new University Funding Council which took over responsibilities for distributing government funding to universities from the University Grants Council, has yet to decide on the funding policies.

Computer Revolution

Computer hardware has gone through a revolution in the last ten years, to the extent that today's best micros are as powerful as the minis of the early eighties and the mainframes of the early seventies. Most software, however, is still being written using the languages and systems developed in fifties and sixties.

The first Fortran program, for example, was published in November 1954, and the specification of Cobol was completed in 1959. Both are still standards for scientific and business programming. Even C, a "modern" language emerged from BCPL in the early seventies.

All these were called "third generation languages" because they were an advance on the first two generations, machine code and assembler. They were quickly adopted because, although not as efficient in machine terms, they enabled programs to be developed faster and maintained more easily.

There has been no similar take-up of fourth generation languages (4GLs). As a result, some programs have millions of lines of code and there is a huge backlog of unwritten software.

Many large software development projects are never completed, and half the ones that are finished never work properly. Some firms spend up to 80 per cent of their data processing budgets maintaining old programs, rather than developing new ones, and some surveys put the productivity of their programmers as low as five lines of code per day. It's like building skyscrapers with house-bricks.

According to the US Department of Defense, the cost of making a change at the design stage is \$10, during implementation it jumps to \$70, but the costs are a staggering \$7,000 when the system is being maintained.

Statement

"For the purpose of studying scientific reasoning, the basic units of language are not words but whole statements".

R.N. Giere.

"Hyper-Xanadu"

Ted Nelson, was the inventor of the terms "hypertext" and "hypermedia", in 1960, while studying for his MA degree at Harvard. At this time he wrote a word processing programme which was, advanced even by today's standards. But Xanadu, his hypertext design, took another 19 years to unfold because no one was willing to back his ideas. Now the hypertext idea may have finally come of age.

According to Nelson, everyone should be able to get instant access to any document, sound recording or video image they require at the computer screens. Behind each image would be "hidden layers" of hypertext information that could be called up when more data on a specific detail is required.

Several computer programs based on the hypertext approach have been published. The first was probably by, Office Workstations Limited (OWL), which published Guide. The Ford Motor Company uses this system in their service bays. Other automobile compan-

ies have also started using hypertext systems for their maintenance and parts manuals. Typically, the first page of the manual shows an illustration of a car. By moving a pointer on the screen to the area of interest such as the engine compartment, the wheel assemblies, or the lights the user can call the relevant part of the document to the computer screen. A further selection with the pointer can reveal the part number and pricing details. Further sections can cause a short video to run, which explains how to fit or remove the selected component.

Cornell Medical College use it as a teaching aid. As we know Apple supplies Hypercard with every Macintosh computer. Many of our faculty members are now developing there own dental teaching programmes using Hypercard.

A year ago, Autodesk, one of the world's most successful publisher of Computer Aided Design (CAD) software, decided to fund Ted Nelson's team. It will announce the first implementation of its "Xanadu" hypertext file storage and access system in November 1989. "Xanadu" will begin its working life as a single-user system, first running on Sun computers, then Macintosh, then on the IBM PC's.



DISCOVERY

"Every baby has to discover more in the first years of its life than Roger Bacon ever discovered in his laboratory. When I was seven years old I discovered the sting of the wasp. But I do not ask you to worship me on that account".

G. Bernard Shaw.

Halifax Medical Computer- software Released

Eleven computer programmes designed to help family doctors keep up with changes in medical education were officially announced at a press conference to launch the new products in Halifax on 23rd May 1989 by Knowledge House Publishing Ltd.

According to the president and founder of the Knowledge House company Benie Schelew, "The half-life of medical information today is only five years". Schelew went on to say that "What that means is that five years after leaving medical school, half the information a doctor learned has been replaced".

The eleven computer simulations, are sold under the name Patient Simulator II, and have received the endorsement of the College of Family Physicians of Canada, a voluntary organization representing most of the family doctors in the country.

According to Dr. Stephen Hart, president elect of the college.

"Medical education today is very much an on-going process. It's not something that you leave at the door of the medical school when you graduate". Dr Hart said that the college requires members to acquire 50 hours of continuing education each year. The college's endorsement was said to mean that Patient Simulator II training would qualify for the non-classroom portion of the annual requirement.

The patient simulators are also being sponsored by Sandoz Limited, a Swiss-based international pharmaceutical company.

The patient simulators programmes are, written in the computer language known as "C", and were originally created as a Macintosh version however, the simulations being released to the market are now designed to run on IBM-compatibles.

To Know and Understand

"Newton wondered why apples fall; Einstein expressed surprised thankfulness that four equal rods can make a square, since, in most of the universes that he could imagine, there would be no such things as squares". Bertrand Russell.

Composite Research

The modulus of elasticity and Poisson's ratio of dental restorative materials is regarded as an important fundamental property, since a material with a low elastic modulus will more readily elastically deform under a given masticatory force. Excessive elastic deformation of the restorative material under functional stress may result in catastrophic fracture of surrounding brittle tooth enamel structure, or alternatively increased micro-leakage may result. The increased use of polymer/glass composite systems as posterior restoratives which will be subjected to much higher levels of force than anterior restorations, might suggest the use of materials with a higher modulus of elasticity in order to minimize the risk of cusp fractures. The moduli of elasticity of dental composite restorative materials is also regarded as an important fundamental property, in terms of stress/strain transfer between resin matrix and inorganic filler in response to masticatory force. Ultrasound is being utilized in our in our Biomaterials research laboratory for determining elastic constants. The ultrasonic method for determination of the elastic modulus of solid materials is based upon the fact that the magnitudes of the velocities of

longitudinal and transverse waves depend upon the elastic moduli. Comparisons of elastic moduli and Poisson's ratio for a range of twenty-three commercial resin composite and unfilled resin systems are being carried out. The use of an ultrasonic test method for evaluating the elastic moduli of composite restorative systems provides a very effective method for the characterization of these biomaterials. Data produced by this *in vitro* method may enable a fuller interpretation of clinical performance data from clinical trials. In addition the method will allow base line comparison for our studies in which we are developing new types of composite filler materials. Some of this data will be presented at the 1989 IADR meeting in Dublin.



FREE MEMBERSHIP OF IADR

& AADS ?

How would you like to have free membership of the IADR and AADS for 1990. If the answer is yes turn to page 6 of the February issue of the Dental Research News for details.

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