

Dental Research News

Research Development Office, (902) 424-1675

VOLUME IV, NUMBER 2.

Unsolved Problems

"In the light of our experience and in view of the many unsolved problems with which dentistry is confronted in the present, our first duty is clearly that of research. It offers one of the greatest opportunities ever given to any profession. Notwithstanding the progress in dentistry, the dental ills of mankind are still almost universal. Their cost in discomfort, deformity, and ill health, is beyond compilation. No one can measure the far-reaching effects of a condition such as this. Some way will have to be found to check dental disorders at their source. This can only be done by a long-range program of research, it is the public who must support it". These words spoken 39 years ago by Dr. C. R. Sellar to the Montreal Dental Club in his Presidential Address in 1951, even with the progress which has been made in dental research, still hold true to-day. The problem of getting public support for the idea of dental research is also still with us.

Materialistic

"Chemistry, as such, never produced as much as a moulded ashtray. Polymers may be designed in the laboratory and produced by the ton in a costly factory, but as materials they are of no particular use until someone has converted them into carpets, conveyor belting, or roofs for sports stadia. This brings us into the province of the engineer, the physicist, and the materials scientist."

C. E. Hollis

Materials Science

"The development of new materials became a recognized science near the end of the nineteenth century after British geologist Henry Clifton Sorby discovered that he could see the crystalline structure of steel by polishing the surface and etching it with acid. The acid selectively wore away certain parts of the structure so that the structure as a whole became more distinct when viewed through a microscope".

T.W. Eagar

National Dental

Epidemiology Project:

A formulation grant application has been submitted to the National Health Development and Research Program to develop sampling and analysis strategies for the national dental epidemiology project. Dr. Amid Ismail (Dalhousie U) is the principal investigator, with Drs. K. Zakariassen (Dalhousie U), G. Thompson (U. Alberta), D. Lewis (U Toronto), J. A. Hargreaves (U Alberta), D. Banting (UWO), and M. Payette (Hôpital St-Luc, Montreal) as co-investigators.

The formulation grant application (\$31,500) represents one of the steps in the process of organizing the first national survey of oral health status and treatment needs of Canadians. In June, 1988, the National Dental Epidemiology Project Coordinating Committee was organized with support from the Professional Resources Utilization Committee of the Canadian Dental Association to plan for an oral health survey of Canadians stratified by province or territory. The lack of data on oral health status, especially of adult and senior Canadians, has been recognized as a major problem facing health planners, dental educators and dental organizations. The Coordinating Committee members with representation from all regions of the country,

defined the objectives, sampling policy, targeted age groups, and dental indices. In September, 1989, the committee held a workshop which was sponsored by NHRDP, Health and Welfare, Canada, to review the plans for the survey and the dental indices formulated. The complex areas of sample selection and analysis of a multi-stage survey were recognized as areas in need for further development. Representatives of Statistics Canada who attended the workshop agreed to develop sampling and analysis strategies for the proposed survey and provided estimates of the costs. The formulation grant application is for funding to cover the costs of Statistics Canada to complete these tasks.

The plan is to submit a proposal for funding of the survey to Health and Welfare, Canada, and other potential funding sources by September 1, 1990. Pilot testing will be carried out in 1991 in Nova Scotia and Quebec, and data collection will commence in the Atlantic provinces in 1991. The survey instruments are futuristic in design and will provide information for the next decade and next century. A copy of the indices to be used is available from Amid Ismail for review.

Faculty attitudes

According to a national survey of 9,996 US faculty members conducted twelve months ago in February 1989 by the Carnegie Foundation for the Advancement of Teaching 25% agreed strongly that performing sponsored research for a private company is not a proper university activity. A total of 44% agreed strongly that they were more enthusiastic about their work now than they were when they began their academic career. The survey indicated that 54% strongly agreed that tenure is more difficult to achieve now than it was 5 years ago. The same number (54%) also strongly agreed that it is difficult to achieve tenure if you do not publish. A total of 38% agreed that in their institution publications were just 'counted' and not qualitatively measured. Asked to consider which items were very important for the granting of tenure within their department a total of 28% said the number of publications, 24% said the type of publication and 20% said research grants received by the scholar. The second highest item was student evaluations of courses taught (26%).

Teaching and Research

Seventy-one percent of full-time professors (about the same number as in a previous survey

in 1984) said that their interests lay primarily in teaching rather than research. In contrast only 35% of those at 'research universities' cited teaching as their chief interest, compared to 93 percent at two year institutions.

Research Money

A total of 18% of full-time professors said that they had received federal research money in the last year. The proportion varied by discipline, with 44% of those in the physical sciences receiving federal support, compared to only 8% of those in humanities. Copies of the Foundations Report "The Conditions of Professorate: Attitudes and Trends 1989", can be obtained for \$12(US), from Princeton University Press, 3175, Princeton Pike Lawrenceville, N.J. 08648.

"As a faculty member for thirty years, it has been my experience that many of the teachers who did no research fell into a rut of their educational experiences and continued to pass those on even though the specific disciplines advanced substantially" Leon Zelby, Professor of Eng. Computer Sci. Univ. Oklahoma.



Clinical Trials Can Be Highly Cost Effective

Budget deficits are forcing more attention to the cost effectiveness of government-funded activities, including biomedical research. A recent study, supported in part by the National Center for Health Services Research and Health Care Technology Assessment (NCHSR), shows that clinical trials of new therapies can be highly cost effective. An excellent paper was published by Allan Detsky "Are Clinical Trials a Cost-Effective Investment," in the October 6, 1989, *Journal of the American Medical Association*.

Detsky's study involved the use of a theoretical model to calculate the expected "return on investment," or the incremental or extra costs required to achieve an incremental unit of benefit. In this analysis, the unit of benefit was additional life-years gained for the target population. Dr. Detsky, of the University of Toronto, analyzed five influential cardiovascular medicine clinical trials and two gastroenterology trials. He selected the cardiovascular trials because the interventions were controversial and because they tested preventive methods as well as medical and surgical treatment. The trials differed vastly in scope, costing from \$100,000 to \$150 million,

and involved conditions that affected from 15,000 to 5 million people in the United States. Mortality rates for these conditions varied from 1 percent to 50 percent per year.

Detsky's findings show that incremental cost effectiveness ranged from \$2 to \$3 per life-year saved for a trial of aspirin in unstable angina to \$396 to \$685 per life-year saved for a trial of coronary artery surgery. The study also shows that the anticipated extra benefit per dollar spent on the clinical trials greatly exceeded the expected incremental benefit per dollar spent on providing health care interventions of proven effectiveness.

According to Dr. Detsky, biomedical research will be shown to be an even better investment if the benefits derived from preventing widespread dissemination or adoption of interventions proven to be ineffective are taken into account, a factor that was not considered in the model. The study was supported by an NCHSR grant and by a grant from Health and Welfare Canada. A clinical trial of dental treatment may be an attractive proposition for an NHRDP grant application? Think about it.

The Following 30
 individuals will be
 presenting research papers
 at the IADR meeting

- BAIN (Poster).
- BENNETT (Poster)
- BORAN (Poster).
- BROWN (Poster).
- BRYGIDER (Oral)
- CREIGHTON (Oral).
- DOYLE (Oral)
- FOONG (Oral)
- GATES (Oral)
- HALL (Poster)
- HARSANYI (Oral)
- ISMAIL (Poster).
- JOHNSON C. (Poster).
- JOHNSON J.A. (Oral).
- JONES (Oral).
- KARST (Poster).
- KAVANAGH (Poster)
- LENARCZYK (Oral).
- MacDONALD (Poster)
- MacINNIS (Poster).
- MILLER (Poster).
- OZCAN (Oral).
- PASS (Oral).
- PERRIN (Poster).
- PETERS (Poster).
- PRICE (Oral).
- RIZKALLA (Oral).
- RUSSELL (Oral).
- SUTOW (Oral).
- SYKORA (Poster).

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Dalhousie

"People know Dalhousie and how important it is both as a university and as a research centre" Donald Sobey.

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Are You Part of It?

"To be abreast of a Profession, it is not enough to read and study about the progress-it is necessary to be part of it!
 Leon Zelby, Professor of Eng. Computer Sci. Univ. Oklahoma.

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In The Cause of Science

"The most famous of debates over a theory of modern science took place in 1860 when Bishop Wilberforce shared a platform with Thomas Henry Huxley (1825-1895). The Bishop concluded his windy attack on evolution by asking Huxley whether his descent from the ape was on his father's or his mother's side. The lean tall figure of Huxley quietly rose. He looked, for a moment, thoughtfully, at the crowd; saw rows of hostile faces; caught the grin of ignorant curiosity; here and there, a hopeful gleam of friendship; and, far back, the young, swift-footed, waiting for the fire. He fixed his eyes on these - then, in low tones, clear, cool, incisive, "*I have come here,*" he said, "*In the cause of Science only.*" "If then, said I, the question is put to me would I rather have a miserable ape for a grandfather or a man highly endowed by nature and possessing great means and influence and yet who employs those faculties and that influence for the mere purpose of introducing ridicule into a grave scientific discussion - I unhesitatingly affirm my preference for the ape. Whereupon there was unextinguishable laughter among the assembly".
 Thomas Henry Huxley.(Alfred Noyes, *The Book of Earth*)

Lessons from the Past.

It is often surprising to find incredible linkages between scientific disciplines which on the surface have little in common. Who would imagine that there would be any possible useful scientific linkage between ancient mummies and modern industrial pollution? However, recent analysis of 2,800 years old mummies has supplied support for the view that dioxins accumulate in body tissues from exposure to synthetic chemicals, rather than, as some scientists have previously suggested, to chemicals arising from natural processes.

Dioxins and related toxic chemicals (dibenzofurans), are present throughout the environment, associated with the manufacture of such modern products as industrial lubricating oils, printing inks, resins, paints, and herbicides.

Although the toxic substances exist only in very low levels in the environment, they readily accumulate in body fat and can cause liver damage and, some scientists suspect, cancer. At one time in the 1970's scientists thought that dioxins and dibenzofurans might also be produced as by-products of the combustion of natural fuels, including wood.

In the October 1989 issue of *Environmental Science and Toxicology*, scientists reported

that they could not detect dioxins or dibenzofurans in mummified remains of nine Chileans individuals, even though they had lived at a time when wood was relied on for cooking and therefore would have been heavily exposed to wood smoke. Because the remains were uncovered at desert sites buried deep in the ground, the scientists said they could rule out chemical contamination or transformation of the remains that might have altered the chemical composition of the tissues they analyzed. It should perhaps always be remembered by all scientific disciplines that it is only from the past that we can find a deeper understanding of the present and the future.

It is possible to obtain scientific evidence from the past in dental research, this can range from examination of skeletal remains aged from a few hundred to several thousands of years old, to examination of extracted teeth or retrieved fillings, crowns or other restorations and implants. All such historic evidence can provide valuable scientific information. Periodic review of the literature from other disciplines may yield useful ideas for dental research. Think about it.

Simplistic

In our Dental Biomaterials Science Courses we inform our students much to their delight, that the subject is not very complicated since they only have to study three types of solid materials, Polymers, Ceramics and Metals. We then inform them that the reason is that these are the only types of materials which exist in the world. Other types of materials merely being mixtures and combinations of of these three.

Recent experiments in Europe and the United States have led high-energy physicists on both continents to conclude that all of the material in the universe is composed of only three fundamental types of matter. In separate experiments, teams of high-energy physicists working at CERN, the European Laboratory for Particle Physics in Geneva, and the Stanford Linear Accelerator Center in Palo Alto, Cal., concluded from the decay, or fragmentation, of a force-carrying particle known as the "z-zero boson" that all of the material in the universe is composed of only three fundamental families of matter. Dr. Barnett, a Professor of physics and astronomy at John Hopkins and a member of the research team at Stanford, said he regarded the conclusion as, "the most significant physics

result since the z-zero was discovered" in 1983.

The recent conclusion, however, was based on a number of assumptions made by the Standard Model, a widely accepted theory that has proved accurate in predicting the existence of nature's fundamental building blocks, but still contains many unanswered questions.

Many scientists warn that this picture may prove to be simplistic. A different picture may emerge once much more powerful particle accelerators, capable of generating much higher energies than those now in operation, are constructed.

This recent development in physics brings to mind the amusing story related by Walter Stewart, who said. "The young physicists are beyond all doubt the noisiest, rowdiest, most active and most intellectually alert group we have here. For them the world changes every week and they are simply delighted by it. A few days ago I asked one of them, as they came bursting out of a seminar, "How did it go?" "Wonderful!" he said. "Everything we knew about physics last week isn't true!" We should all try to be like Stewart's young physicists eager to disprove the dogma.

Brave New World of the 90's

Two University librarians (Sharon Rogers, Librarian at George Washington University and Charlene Hurt director of libraries at George Mason University), recently wrote a controversial article (Chronicle of Higher Education, 18/10/89) in which they suggested that scholarly journals were obsolete as the primary vehicle for scholarly communication. They cite the recent furore over "cold fusion," for example, which was developed entirely outside the scholarly-journal process. However, this is perhaps not a very good example since peer review may well have prevented this material from being published and it may not have seen the light of day.

However, they do have some very convincing ideas and arguments. The authors point out that we need to harness the available technologies in order to reform the entire system of scholarly communication. It is pointed out that in the United States alone \$500-million is spent annually on journal subscriptions which could finance a new system. The journal costs at Dalhousie University are a very significant proportion of the non salary operating budget. In just 10 years, the average

costs of research journals has increased 160 percent, some individual journals have increased by 300-400% and it is likely that the trend will continue. On top of this in Canada we have the added problem of a dollar exchange which can dramatically change the costs of journals from across the border. In addition more than 5,000 new journals, some in new fields, began publication in 1988 alone creating even more pressure on our already ailing library budgets.

The authors suggest that five years from now, a new electronic system could be a reality if only universities and scholars, choose to accept this 21st-century option.

Rogers and Hurt suggest that researchers could "publish" their articles on a **Scholarly Communication System**, an electronic network on which they could also read other publications. An article or "paper", would be sent electronically to the system, where it would be assigned a category and cross-referenced to other relevant categories. Since dentistry is becoming increasingly interdisciplinary in nature, the capacity to alert scientists in other subject areas would help build important
(Cont page 9)

Brave New World, (cont)

links for dentistry with other disciplines. The authors suggest that the system could provide three new capabilities: a "notes and comments" section, citation tracking, and a usage log. Scholars with valid passwords, (for a modest annual fee), could leave signed statements related to the article's content in the comments field immediately after an article entered the system. The comments could contain suggestions for references to other literature, ideas for clarifying arguments, rebuttals of arguments, notes of possible errors in data or interpretation, and even compliments on the quality of the contribution.

The system would permit responses to be added to the comments section. The comments would be checked automatically to assure their validity (through a program matching names with users' authorized numbers).

It is suggested that the new system would be a valuable communication tool for academics while their research was under-way. In the "search only" mode, researchers could seek data from all the content tracks and could gain access to archival as well as to current files. The system would be available 22 hours a day to

anyone paying the hourly usage and printing charges, leaving 2 hours of "down" time for maintenance.

After an article had been in the system for six months collecting comments and citations, it could be reviewed. The author would be notified and would be given a specified time to prepare a final version for review. The author would be able to use responses from the comments section and information about citation patterns to create a revised version. If the author failed to respond to the review notice, the article could be removed from the system.

Review boards would perform the function now undertaken by editors of scholarly journals in which blind reviewing would take place by a panel of scholars in the field. It is suggested that the reviewers place an article into one of the following categories:

- 1) Original contribution.
 - 2) Logical extension of research.
 - 3) Application of a theory or method.
 - 4) Interpretation of existing research.
 - 5) Review article.
 - 6) Seriously flawed in research design, experimental technique, or conclusion.
 - 7) No scholarly contribution.
- (cont. page 10)

Brave New World, (cont)

It is suggested that other researchers using the system would be able to use these seven fields to limit their searches, thus avoiding having to pay to retrieve articles they would not use. It is suggested that each author would be asked to recommend a category characterizing the "research technique" used. This would permit users to locate studies in which they were interested. Information of this type is very difficult to find through the search indexes now available.

The authors claim that using modern communication technology for research publication would result in improved scholarly communication since errors could be noted more quickly and corrected more easily.

An appeal process is suggested for researchers whose work has been labelled as "seriously flawed" or as having no scholarly contribution" by reviewers.

It is an idea which has many excellent advantages over our present system, however, capital costs for setting up the system and reluctance of academics to cooperate not to mention the fierce opposition of publishers make the possibilities seem rather

remote for the time being. It is suggested that libraries could print files in formats requested by users, using sophisticated graphics software and colour printers to reproduce the digitally stored images, thereby overcoming resistance to electronic journals.

The new scholarly communication system for the year 2,000 could provide substantial economic advantages to universities, as well as reducing the need for more library space. The authors state that in 1989, each square foot of new library space in the US costs an average of \$95.43. A major benefit would be the sophisticated indexing of journal contents with the ease of finding and selecting the journal information required.

The system suggested would require the establishment and enforcement of international standards for the formats used for the storage of data. All scholars would thus be assured that computerized material would be easily retrievable in the future.

Since universities could have a prescribed role in choosing the members of review boards. It is suggested that the system could provide better information for universities when they make informed
(cont. page 11.)

Brave New World, (cont)

personnel judgments with respect to tenure and promotion.

The futuristic world portraied by Rogers and Hurt may not be all that far off, we have the technology at hand. NOVANET is in place which allows us to review books available in local university libraries. In the United States 14 libraries across the country are participating in a programme allowing electronic access to the library of Congress's computerized data bases. This includes the automated card catalogue, the listing of the status of bills in Congress, and the copyright-information service. However, the complex economics of large scale world-wide network systems may slow down the implementation. The Library of Congress has recently backed off attempts to license those who use its computerized cataloguing system. Libraries now pay only the cost of producing the catalogue card. The US library organization argued that many of the records on file are generated by university research and that they should not be charged to use what is basically their own material.

The Library of Congress's proposed policy was said to be aimed principally at

commercial and foreign users of the records system. Librarians claim licensing would hamper free exchange of bibliographic records among their libraries, because some U.S. libraries have exchange programmes with, private, or foreign libraries. The On-line Computer Library Center (O.C.L.C), estimated that the proposed fees could amount to more than \$6-million in the first year for its 7,000 library members. O.C.L.C. is a computerized library network that maintains bibliographic information on its members' books and other materials. The Library of Congress said that it will re-assess the programme.

Although Rogers and Hurt's new electronic publication system is not yet with us a scientific journal in computer chemistry, "Tetrahedron Computer Methodology," is now being published in both paper and electronic formats. The bimonthly journal is distributed (\$71/yr.) in a binder containing both the bound issue and computer disks in Apple Macintosh or I.B.M. PC format, which hold the full text of the journal, plus additional material from the authors. It is clear that Journals and electronic versions will co-exist side by side for some time to come.

