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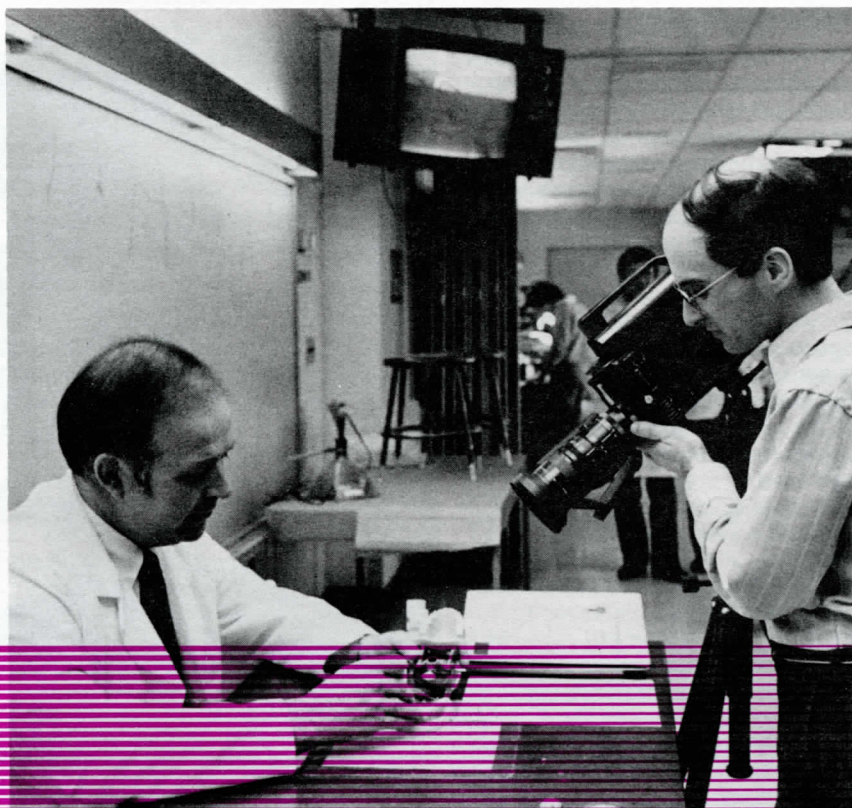
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S p e c t r u m

Dental materials:

New techniques allow varied treatment options

by Marilyn J. Davis

A revolution in dentistry, sometimes quiet, sometimes explosive, has occurred over the past 10 to 12 years. During this brief period, the science of dental materials has experienced growth and change that rival previous decades of progress. And just as exciting, this revolution has lost none of its steam, but is ongoing; new techniques and materials still are being discovered, honed, researched, perfected. The Goldman School, through research, education and patient care, is a part of this revolution.

According to Dan Nathanson, D.M.D., professor and chairman of the Department of Biomaterials, two of the most significant advances in the science of dental materials have been acid-etched bonding and the use of composite materials—techniques that had their commercial start in the early 1970s and now are used widely for preventive, restorative, operative and other aspects of dentistry.

Acid-etched bonding entails the application of phosphoric acid to tooth surfaces, which creates a porosity, or roughness. A liquid plastic then is applied to the microscopically roughened tooth surface, and to this is attached an additional plastic, the restorative material. The procedure is simple, virtually painless, relatively quick and fairly inexpensive.

Nathanson says that bonding also allows dentists to get superior tooth restorations more easily than those achieved by earlier methods: "Before bonding, all restorations necessitated 'under-cutting,' cuts made to mechanically anchor the restorative mate-

rial to the tooth. One of the real advantages to bonding is that little or no cutting is required to repair a damaged tooth." In addition to its use in restorative dentistry and as a pit and fissure sealant for prevention of occlusal caries, bonding is employed in cosmetic dentistry to alter teeth that may be too small or discolored, in orthodontics to fasten brackets directly to the teeth, and in periodontology to splint loose teeth to ones that are secure.

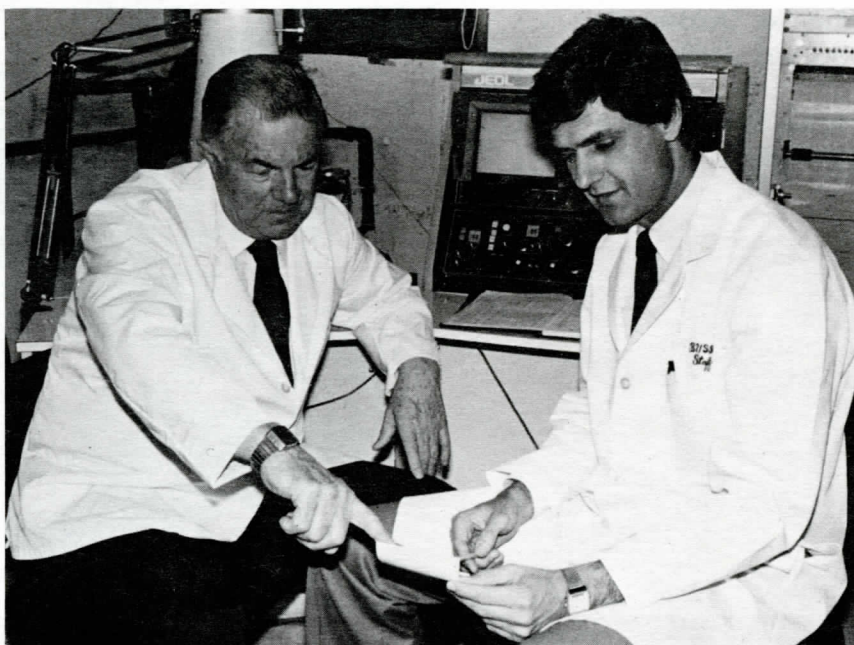
The development during the '60s and '70s of composites, tooth-colored materials that consist of an epoxy plastic filled with a quartz or glass powder, has accompanied and complemented bonding techniques. "The combination of acid-etched bonding and composite materials have created cosmetic dentistry as we know it today," says Nathanson.

Techniques have limitations

However, these remarkable materials currently have certain drawbacks, among them the possibility of deterioration and color change over time. Nathanson says that some color change occurs within three to six years in about half of all patients. He also says that most composite materials are not considered strong enough for use on chewing surfaces. But the biggest drawback to bonding with composites, according to Nathanson, is that the material currently available will adhere only to the enamel, or exterior of the tooth surface, and not to the dentin, or inner surface.

Not surprisingly, numerous research efforts aimed at eliminating these problems now are under way, among them several projects headed by Nathanson. Appearance changes are becoming less problematic as more color shades and shade modifiers are developed. Textural roughness or change caused by the gradual wearing away of the composite filler powder also may soon become things of the past because manufacturers are minimizing the size of powder particles—from 40 microns down to one and even submicron particles in some methods. According to Nathanson, smaller particles allow for much less abrasiveness as the materials wear.

The problem of durability, another negative factor associated with composites and bonding, also may be eliminated. Nathanson says that a new method of polymerization involving intense visible light may end porosity and incomplete polymerization, the main causes of deterioration. Light polymerized composites use materials that do not need to be mixed by the dentist, but polymerize automatically upon exposure to a



Lloyd Chaisson, D.D.S., director of clinical operations and professor and chairman of the Department of Operative Dentistry, and Dan Nathanson, D.M.D., professor and chairman of the Department of Biomaterials, discuss a specimen being prepared for analysis by the scanning electron microscope.

strong light source. In addition to giving the dentist more working time, these vacuum-packed, pre-mixed materials eliminate the air bubbles that cause porosity and result in longer polymer chains and a stronger composite.

The wearing away of posterior composites, currently a problem, also may be resolved soon. According to Nathanson, manufacturers are combating this difficulty by reducing the particle size of composite filler, as mentioned earlier, and by "loading" composites, or increasing the number of particles in the filler. By increasing the load of filler particles in dental composites from 70 to 85 percent, the filler-to-resin ratio is altered drastically, and seems to make the resulting composite more resistant to abrasion. Nathanson says that manufacturers also are exchanging quartz fillers for softer glass fillers, another factor that seems to add to wear resistance.

"With the combination and interaction of all these advances, the resistance of these composites is truly maximized," says Nathanson. Although many of these materials and advances will be available shortly for general use—some in fact already are—Nathanson says that six to seven years will be required to completely assess their effectiveness.

Studies ongoing at School

The investigation of these substances and techniques poses another problem, one that Nathanson hopes he may help to solve. Currently, there

is no existing system that reliably tests the wear of composites in an accelerated fashion. Chemical, physical and mechanical conditions within the oral cavity have not been sufficiently simulated by any testing method. The drawbacks to this situation are obvious: dental researchers lack the means to test materials sufficiently before using them on patients; the response of the material when used on the patient is itself the test.

To help remedy this situation, Nathanson is conducting research using monkeys as test subjects. According to Nathanson, the deterioration rate of monkeys' teeth is approximately three times that of humans. This accelerated deterioration rate will enable Nathanson to evaluate the usefulness of selected composites in a relatively short period of time. The study is in its first phase, which involves testing the system's feasibility. Nathanson will concentrate later on testing the actual composites.

Nathanson also is involved in two projects that aim to solve the problem of bonding to dentin. Because dentin is less calcified than enamel, straight acid-etching causes demineralization of the tooth and does not allow for retention of the bond. According to Nathanson, several dental companies are investigating chemical methods to effect this type of bond. One material developed in England, called glass ionomer cement and restorative, seems to form an acceptable bond with dentin.

Continued on page 5

Developments in Oral Diagnosis aid students, patients and faculty

Several new diagnostic methods being used by the Division of Oral Diagnosis/Radiology are helping to keep the Goldman School at the forefront of education and patient care, according to Farid Boustany, D.D.S., D.M.D., an assistant professor of dental care management, radiation safety officer for the School and clinic director of Oral Diagnosis/Radiology.

One of the newest additions to the Division is a Xeroradiography 110 machine, recently donated to the School by the Xerox Corporation. "This is the first such machine on the East Coast," Boustany said. "I feel that it will open a whole new era in diagnostic radiology."

The new system improves the imaging and sharpness of intraoral radiographs through its ability to show different structural densities—something conventional films cannot do. The machine also reduces the amount of radiation to which patients are exposed by 30 percent. "The School is committed to a policy of maximum radiation safety," Boustany said.

Other measures employed by the Division to reduce radiation exposure by patients and dental health personnel include the use of a faster film for intraoral radiography and a new "rare earth" film, a high-contrast film that provides excellent imaging for extraoral radiography. Boustany

explained that faculty and students at the School currently are experimenting with the film, and have found that it improves the sharpness of radiographs and decreases radiation amounts by 50 percent.

The Division also is using another new radiographic technique known as the sialogram. This method facilitates exploration of the salivary glands by revealing the penetration of a contrast medium, or dye, which is injected into the gland. Any pathology, such as a tumor, is immediately evident on the radiograph. Boustany said the Division also is expanding its radiographic capabilities for exploration of the temporomandibular joint.

In other areas, the Division is working closely with University Hospital to meet the dental health needs of patients. Boustany said this partnership has helped structure a protocol for dental treatment for such patients as those requiring ventilators or dialysis machines.

Boustany added that because of the increased concern over blood and saliva-related diseases, an updated School protocol for disease protection has been developed. This protocol includes identification of potential disease-carrying patients, proper diagnosis of such patients and improved sterilization methods.

There are new developments in the classrooms as well as in the clinics. The didactic curriculum of Oral Diagnosis/Radiology for sophomores and juniors has been updated by the addition of audiovisual material and new

demonstrations, and the Division is producing video cassettes for teaching purposes.

Boustany also detailed a new continuing education course aimed at preparing dental auxiliaries for the Dental Radiation Health and Safety Examination, which is administered by the Dental Assisting National Board, Inc. This exam is a new part of the Dental Assisting National Board Examination. All present dental assistants are required to pass it before 1985 in order to achieve certification in radiology. Boustany said GSGD is the first dental school in the country to offer such a course. He added that the School's radiology staff will participate in the course.

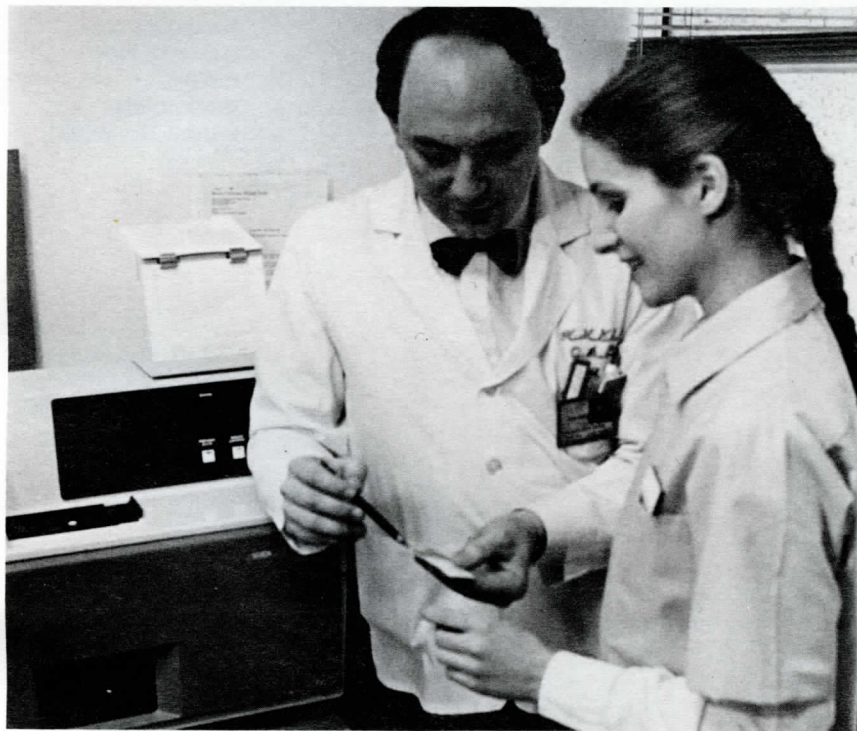
Goldman School receives grant to investigate dental advertising

The Goldman School recently received a grant of \$38,722 from the American Fund for Dental Health to analyze the effects of dental advertisements on consumers. According to the project's principal investigator Anthony Jong, D.D.S., associate dean for academic affairs and professor and chairman of the Department of Dental Care Management, the effect of advertising on consumer utilization of dental services is not clearly understood.

The study will be administered at private dental offices that use advertising, and will elicit information from at least 3,000 patients. Jong said he hopes the study will determine whether a majority of the patient respondents are those who have neglected dental care in the past, and whether advertising tends to redistribute patients among different practices. Jong also hopes to discover if there are demographic factors that distinguish patients who respond to ads from those who do not.

"My hope is that this study will give us solid evidence that advertising does attract patients to seek out treatment, and that properly directed marketing ultimately will improve the dental health of the population," Jong said.

Other faculty members associated with the one-year study, which began Jan. 1, are Mitchell Burek, Ph.D., an associate professor of dental care management and director of evaluation services and the graduate program in dental care management; Paula Friedman, D.D.S., an associate professor of dental care management and director of the Division of Oral Diagnosis/Radiology; and Sandra Kranz, R.D.H., a clinical instructor in dental care management and coordinator of postdoctoral programs.



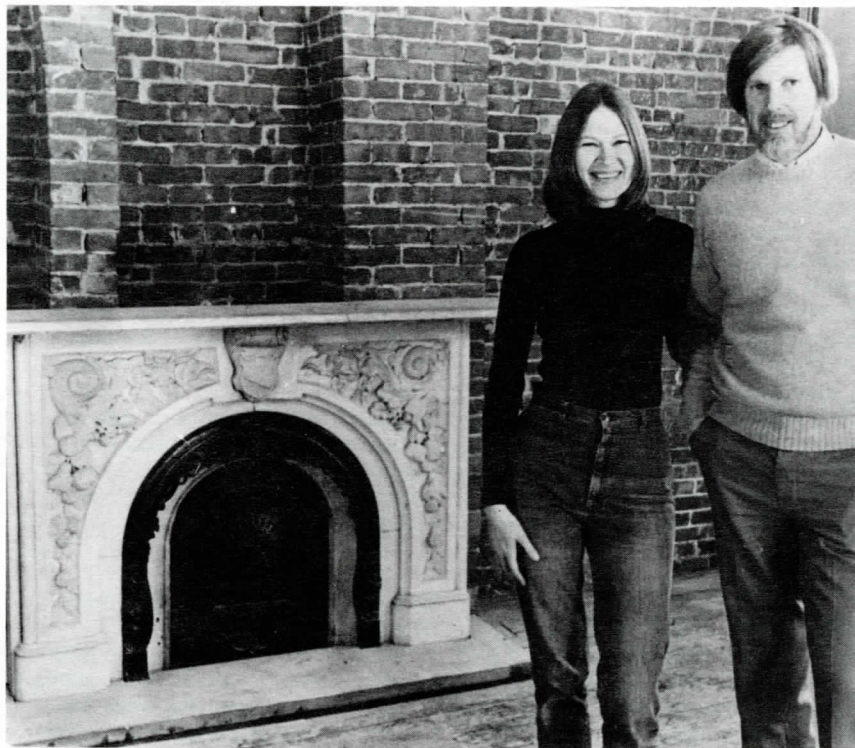
Farid Boustany, D.D.S., D.M.D., an assistant professor of dental care management, radiation safety officer for the School and clinic director of Oral Diagnosis/Radiology, demonstrates the use of the Xeroradiography 110 machine to Margaret Jones, D.M.D., Class of 1986.

Richardson renovates apartment building, wins community award

Where most people saw only a ramshackle South End apartment house, John Richardson, D.D.S., saw a beautiful Victorian building fallen on hard times, and he set to work to restore the building to its former glory. He reaped the benefits of his foresight when he recently was awarded the That's My House Award in a competition sponsored by Newworld Bank to recognize architectural contributions to Boston's neighborhoods.

Richardson, director of predoctoral endodontics and professor and chairman of the Department of Oral Pathology, purchased a run-down building on Massachusetts avenue., in the Chester Park area, in 1978. The decaying 1865 brownstone obviously needed considerable work, but Richardson was not deterred. "I saw that both the area and the house had a great deal of potential," said Richardson. "I was interested in improving both of them."

Approximately four years ago he began renovating the building with the assistance of an architect. His first task was to remove an unattractive storefront, which had been added during the 1930s or 1940s and used as a laundry. "It completely spoiled the appearance of the building," Richardson said. Over a period of four years Richardson removed the storefront, thereby reconstructing the entire facade of the apartment house. He also replaced the crumbling brownstone with new stone, strengthened the building's foundation and began interior renovations.



Standing in the living room of their award-winning South End apartment house are Elaine and John Richardson, D.D.S. Richardson is director of predoctoral endodontics and professor and chairman of the Department of Oral Pathology.

Richardson's work was voted as the best in the South End by a community group acting in conjunction with Newworld Bank, and he received the \$1,000 award along with other such winners from each of Boston's neighborhoods.

Richardson said that he feels strongly about the possibilities for the South End's rejuvenation. "The South End is one of the largest contiguous neighborhoods of Victorian architecture in the country, as well as one of

the most ethnically mixed," said Richardson. "I think that with proper direction the area can maintain its integrated character, the advantages that it has as a neighborhood, and be recognized as a good place to live and work."

School faculty, staff take part in 9th Annual Yankee Dental Congress

Some 15 faculty and staff members from the School participated in the 9th Annual Yankee Dental Congress, held at the Sheraton-Boston and Colonnade hotels and in the Hynes Auditorium Jan. 12 through Jan. 15. The Congress was sponsored by the Massachusetts Dental Society in cooperation with the Maine Dental Association, the New Hampshire Dental Society, the Rhode Island Dental Association and the Vermont State Dental Society.

Departments represented, faculty members involved and the courses or lectures they conducted included:

Dental Care Management: Michael Tulman, C.P.A., "Financial and Tax Planning for the Dentist," and "The

Pulse of Your Dental Practice"; *Endodontics*: Lisa Germain, D.D.S., "Difficult Endodontic Diagnosis—Which Tooth is It?"; H. Robert Nagel, D.D.S., "Traumatic Injuries and Fractures Involving the Pulp";

Operative Dentistry: Paul Ponte, D.D.S., "Comparison of Posterior Restorative Materials";

Periodontology: Gerald Isenberg, D.D.S., "Realistic Expectations in Periodontal Therapy"; Leonard Shapiro, D.M.D., "Necrotizing Gingivitis—Fact vs. Fiction"; Hyman Smukler, D.M.D., "Periodontal Procedure Selection in Comprehensive Treatment";

Prosthodontics: Burney Croll, D.D.S., "Custom Tooth Shade Guide Fabrication for Dental Ceramics"; Joseph Garvey, D.D.S., "Restoration of Endodontically Treated Teeth"; and Douglas Riis, D.M.D., "Prevention and the Geriatric Patient."

Faculty and staff members who served on committees included: *Dental Care Management*: Mary Tavares, D.M.D., Room Coordinator; *Endodontics*: Sydell Shaw, D.D.S., Dental School Representative; *Orthodontics*: Leonard Bernstein, D.M.D., General Arrangement Committee; *Prosthodontics*: James A. Fiore, D.M.D., General Arrangement Committee; and Remo A. Sinibaldi, D.M.D., Steering Committee, General Arrangement Committee, presiding chairman for Lab Technology.

The School's Alumni Reception was held in the Fairfax Room in the Sheraton-Boston Hotel on Jan. 13. Approximately 500 alumni, faculty, staff and students attended the event.

Message from the Dean

Dear faculty, students and staff,

"New." "Improved." How often do you see and hear those words? They blare forth daily from television and radio; are emblazoned in strident letters across newspapers and magazines. Paper towels, soap, cough medicine, toothpaste, anesthetics: No product is immune from the "new and improved" label. I have read that the word "new" ranks with "free" as one of the most widely used advertising buzzwords.

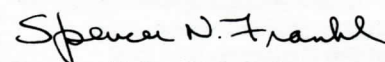
Unfortunately, "new and improved" often is merely a pitch to sell the same old item or service. I feel that the constant use of words such as new and improved dulls our response

to them, and diffuses our reaction when such words are used legitimately. It is possible to overlook the truly innovative amidst the clamor of the less worthy.

Stories about the "new" dominate this issue of *Spectrum*, but I hope to head off the professional's natural skepticism by confirming the worth of these advances, which range from an update on our new radiological equipment, to advances in orthodontic therapy, to the significant recent strides made in dental materials. Whether these advances and others like them affect us as directly as a new Xeroradiography machine or as broadly as the developments in composite materials, they have the potential to influence our curriculum, our practice methods and our profession.

I hope that we will not allow the constant barrage of "new and improved" to desensitize us to the vital importance of discovery and advancement to dentistry. Perhaps more than any other profession, the healing arts must rely on constant forward motion, on exploration of the unknown, to maintain the best possible health care. Our responsibility is not only to serve and heal, but to solve problems as well. We know where the limitations of our profession lie, where answers are needed—we must do everything in our power to continue to provide them.

Sincerely,



Spencer N. Frankl, D.D.S.

Dental Materials, from page 2

In the United States, materials have been introduced that can form an intermediary bond between the composite restorative and the dentinal layer. However, Nathanson says that the bond strengths of these materials is not yet comparable to that of enamel etching, and further research is necessary. Researchers at the National Board of Standards in Washington, D.C., reportedly have discovered a dentin bonding system with a strength comparable to enamel bonding in lab tests, but Nathanson says that possible toxicity of the material still needs to be determined.

Nathanson's projects at the School involve investigation of two aspects of the dentin bonding problem. One area of research is aimed at screening different systems for their retention of bond strengths in different depths of dentin. In the second, Nathanson is experimenting with a dentin bonding system he helped to develop that currently is useful only for bonding metal posts to devitalized teeth. He hopes his research will expand the potential applications of this system. Nathanson stresses that research into the concept of dentin bonding is only in its infancy, and two to four years will be necessary to determine the clinical success of all of these systems.

Older materials are improved

But advances such as bonding and use of composites are not all that is new in the science of dental materials. According to Lloyd Chaisson, D.D.S., director of clinical operations and professor and chairman of the Department of Operative Dentistry, such materials as silver amalgam, which have been in use for years, also have undergone changes. "The profession sometimes takes for granted materials and techniques that

have been around for a long time," says Chaisson.

He cites numerous improvements in today's silver amalgam restorations, including better longevity, more predictable results in the behavior of the material, better marginal integrity of the restoration and more complete removal of corrosive products that tended to deteriorate the amalgam. The formulation of gold alloys also has improved, Chaisson says, and the use of less-expensive, semi-precious alloys has helped lower the cost of restorations.

Other related advances that assist the dentist include today's sophisticated high-speed instrumentation, says Chaisson, which aids in tooth preparation. Better suction systems and greater use of rubber dams, which allow the dentist to control the oral environment, also are assets to both patients and dentists. The pre-dosed packaging of materials allows for simplification and consistency of the mixture of the amalgams. Anesthetics too have seen improvement; injections have been made smoother and easier by the addition of Teflon to the inside of the anesthetic carpule.

Chaisson says future research should focus on the effect of both new and older materials and techniques on the patient. "There has been a great deal of funding from various sources over the last 30 years in the area of material science," he says. "We now must determine exactly how these materials react when placed in the human body." Chaisson emphasizes that research into the effects of dental materials on the patient must involve numerous scientific disciplines, including toxicology, chemistry, metallurgy, physiology and microbiology.

Obviously, new techniques and materials affect every facet of dentistry, and research is being con-

ducted in all fields. Among them is the domain of prosthodontics, which may see significant change in the future, according to Ronald Granger, D.D.S., a professor and chairman of the Department of Prosthodontics.

Granger says castable porcelains currently are receiving a great deal of attention and enthusiasm from researchers. These new porcelains seem strong, aesthetically pleasing and accurate—a pleasant surprise, according to Granger, because of porcelain's reputation for shrinkage. He also feels, as does Chaisson, that the use of non-precious alloys is a boon to dentistry because of their low cost and versatility.

Luting media, or cements, are another area undergoing research. Granger says that problems involving the luting medium may be an overlooked and under-researched area in fixed prosthodontics—which is unfortunate, because the medium's solubility often makes it the weak link in prosthodontic restorations. "We do have adequate luting media available, and if we handle the mixing and proportions correctly we will achieve maximum results, but if not, it is possible to get less than adequate performance," says Granger.

But in addition to the many technical advances affecting dentistry, the human element that allows new materials and techniques to be used to their fullest advantage should not be overlooked. Chaisson feels that today's dental school graduate has a substantial knowledge of materials and basic science because of increased academic emphasis on those subjects. He also cites a general improvement in the oral health of the public, and a more sophisticated and knowledgeable patient population willing to explore dentistry's expanding new treatment options.

Doyle becomes diplomate of pedodontics, orthodontics boards

Walter Doyle, D.D.S., a visiting professor of pedodontics and an alumnus of the School's orthodontics program, is the first dentist to become a diplomate of both the American Board of Orthodontics and the American Board of Pedodontics. Doyle also is a past chairman of the latter organization.

Doyle received his Doctor of Dental Science degree from Emory University in 1959, and his certificate in orthodontics from the Goldman School in 1976. He also holds a Master of Science Degree in pedodontics from Indiana University School of Dentistry, Bloomington, Ind. Doyle is past president of the American Society of Dentistry for Children and past president of the Southeastern Society of Pedodontics.

Doyle specializes in both pedodontics and orthodontics in his private practice in Lexington, Ky., and holds an appointment at the School as a visiting professor of pedodontics.

Briefly:

Justin Altshuler, D.M.D., a clinical professor of dental care management, and *Dan Nathanson, D.M.D.*, a professor and chairman of the Department of Biomaterials, recently participated in Extravaganza II, a seminar sponsored by Den-Mat Corporation and held in Maui, Hawaii. Altshuler spoke on "Marketing and the Dentist's Professional Self-Image." Nathanson conducted a seminar entitled "Latest Developments in Dental Composite Systems and their Effect on Cosmetic Dentistry."

■ *Herbert Bernstein, D.D.S.*, an associate clinical professor of oral and maxillofacial surgery, was elected a regent of the Alpha Omega International Dental Fraternity at the fraternity's recent meeting in Palm Springs, Calif.

■ *Asuncion Garcia, M.D., D.D.S.*, a master's degree candidate in the Department of Endodontics, recently received a Fulbright-Caixa Award, which will pay her tuition and research costs during her time at the School. Garcia received her Doctor of Dental Science Degree at Central University in Barcelona, Spain, and her medical degree at Autonoma University, also in Barcelona.

Herbert Schilder, D.D.S., assistant dean for continuing education and professor and chairman of the Department of Endodontics, recently appeared on WBZ-TV's "People are Talking," which is hosted by Nancy Merrill. Schilder, along with members of the dental and medical community, discussed the pros and cons of advertising and franchising in dentistry and medicine and the possible effects of such practices on the patient.

■ *Richard Whitman, D.D.S.*, an assistant professor of oral and maxillofacial surgery, recently appeared on WSKB-TV's "Daytime." Whitman discussed with host Alison McCann the problems of dental fear and anxiety, and techniques used to minimize those emotions in the dental operatory.

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