

Gil Jain

A tooth's eye view of endodontist Dr. James B. Roane.

MIRACLES IN THE MAKING

*Remember your childhood trips to the dentist,
when tooth decay was a way of life?
If you still think of dentistry as all cleanings,
fillings and extractions, you haven't been
to the OU College of Dentistry lately.*

By MARY LYLE WEEKS

One of the University of Oklahoma's best-kept secrets is tucked away in the Dental Clinical Sciences Building on the Health Sciences campus in Oklahoma City. Here, while earnest young dental students struggle to master the basics of their profession, a group of innovative, creative and hard-working faculty members are putting the more sophisticated magic of modern dentistry to work — often changing the lives of those who come to them for help.

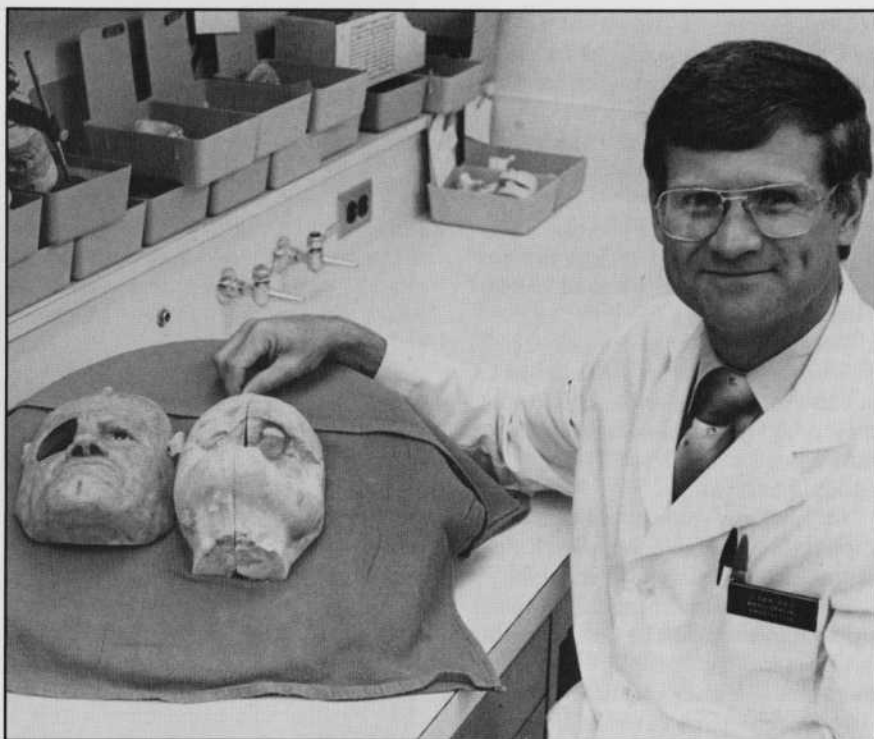
Most of the time, professors at the College of Dentistry carry out teaching and supervisory duties in the classrooms, clinics and laboratories where each dental student spends 35 to 40 hours a week. Then for one day, faculty members can sharpen their own specialized skills in the Faculty Practice Clinic.

"We do a lot of nice things that no one in the state knows about," one faculty member confides. The secret he shares with his colleagues, his students and his patients is simply that for many years now, dentistry has been more than fillings, extractions and braces. Some of the services they perform border on miracle-making.

One of the miracle workers is Dr. Joseph Cain. His area of specialization is maxillofacial prosthetics, intimidating words that to some people have meant the difference between mere existence and meaningful living. In simplest terms, Cain constructs replacement parts for the interior of the mouth and the exterior of the head and neck.

The most dramatic example of Cain's work is the prosthesis he made for Fred, a man of 73 who had lost most of his face through repeated cancer surgeries. All that remained was one eye and his lower jaw. In the center of his face was a hole where his mouth and nose had been. Understandably, the man had become a virtual recluse.

With the aid of photographs, a facial prosthesis, which Cain describes as a "cosmetic bandage," was constructed to look like Fred before the surgeries. It worked much like a Halloween mask, fitting over his face to fasten at the back of his head with Velcro straps. An opening was left for his remaining eye.



Dr. Joseph Cain, a specialist in maxillofacial prosthetics, poses with the cast of the face and the full facial prosthesis which was used by his patient Fred.

"Fred was quite happy with it," Cain says. "He used it for about six months and got along well." Cain had started to make something more complex and cosmetically pleasing when Fred became ill and spent the remaining year of his life in a Veteran's Administration nursing facility.

Cancer had left another of Cain's patients with a facial cavity where her left eye had been. For this woman, Cain constructed an artificial eye surrounded by silicone skin to cover the cavity. These synthetic substitutes for lost tissues are called extraoral prostheses and can include the replacement of all or part of the nose, the ear, the eye globe only, or the eye and its associated structures. The prostheses most commonly are made from silicones, acrylic resins and vinyl polymers.

Intraoral prostheses are those designed for the inside of the mouth. Usually made of acrylic resins and cast chrome alloys, they may be temporary, such as one to prevent the minor segment of bone from collapsing after a cleft palate lip is closed, or ones such as a splint for a broken jaw or an aid for infant feeding. A definitive pros-

thesis would be a denture made to close a hole in the roof of the mouth.

Cain is quick to point out that, however dramatic they may be, facial prostheses are only a small part of his work.

"That's not to minimize their importance," he says. "Some of these patients have a long life expectancy but because of disfiguring surgery, they become quite reclusive. Facial prostheses make people psychologically more comfortable about going into public. It improves their lives. I feel very strong about the quality of life."

Certainly no student in the College of Dentistry is doing the kind of specialized work Cain does. However, their knowledge of his work could have far-reaching effects in referring their future patients.

The College of Dentistry officially began when Dr. William E. Brown was hired in 1969 to organize the state's first program of dental education. The first class of 24 was admitted in 1972, and the building was completed in 1976. Brown is still dean of the University's youngest professional school and believes the college has come a long way in a relatively short time.

"Our faculty is remarkable," he says. "They do innovative work. They spend an enormous amount of time teaching or supervising in the student clinics. And they have a private practice one day a week. That's a demanding load."

Brown says 70 to 80 percent of students admitted to the college already have completed four years of college and/or a degree.

"We encourage them to get a complete college education, with as broad an experience as possible before they come here," he emphasizes. "And we want the *good* students. This is a demanding curriculum."

The first two years of dental school emphasize basic science, pre-clinical technique and behavioral sciences.

"In addition to technique, we teach our students about the psychological development of people, including themselves, so they can deal not only with apprehensive patients but with the stress of being a health care professional."

Students begin pre-clinical work under close faculty supervision using mannequins with teeth. Additionally, during the first year, they examine and work out home dental care programs for each other.

"In the second semester," Brown says, "they perform a prophylaxis on a live patient." A prophylaxis is the scaling and polishing of teeth — what a layman calls cleaning the teeth.

Second-year students move on to simple fillings and to treatment of patients with periodontal problems. As juniors, the students begin more complicated work — root canal treatment, crowns, bridges and partial and complete artificial dentures.

"All of this is done," Brown explains, "under close faculty supervision and careful monitoring. A faculty member in the clinic has a complete view of 12 students and 12 patients. And many times a faculty member assists in a treatment."

The senior year is similar to a medical residency as students are encouraged to become more independent in their work.

Brown is candid about decreased applications for admission to the college and the changes taking place in dentistry.

"Our class size has diminished from a high of 72 in the '70s to 57 last fall. In fall 1985, we will admit only 50. I think there are several reasons for this. One is a natural cycle — interest in various occupations rises and falls. A second is the high cost of a dental education. Even when tuition for dental and medical educations are identical, dentistry is more expensive because the students must purchase their own instruments."

Brown believes the third reason is the changing marketplace.

"There's no question that there is a big drop in the number of children with cavities. That drop means there is less work. On the other hand," he reasons, "what is going to happen, as people in our society live longer, is that we will begin to spend more time dealing with older people who have more complicated needs."

"Maybe 90 percent of the population have some form of periodontal disease. If we were to treat all that exists, it would probably take 8 to 12 billion dollars."

A major problem faced by older Americans is periodontal disease, sometimes called pyorrhea, the leading cause of tooth loss.

Dr. Herman Tow is the chair of the department of periodontics.

"The disease is a tremendous health problem," he says. "Depending on the study, maybe 90 percent of the population have some form of periodontal disease. If we were to treat all of the periodontal disease that exists, it would probably take 8-12 billion dollars."

Forms of the disease may develop early in life.

"There are at least two forms of destructive periodontal disease that can occur in children who still have their baby teeth," Tow explains. "Another form occurs in the early teen years. What I call plain old garden variety adult periodontal disease can occur

anytime after age 21, begins to be seen in more people aged 30 to 35, and is very common after 35."

Current research is attempting to identify the specific microorganisms that cause periodontal disease. If this is accomplished, it may be possible to develop a vaccine against these organisms, although Tow believes that is years in the future. In the meantime, dentists treat the problems that result from the disease, bone and gum loss. One treatment for gum loss was developed by Tow and another OU periodontist, Dr. Art Vernino, when they both were working at the Naval Graduate Dental School and the dental sciences department at the Naval Medical Research Institute.

"One of the things being done at the tissue bank at NMRI was the use of freeze-dried skin as graft material for patients with massive burns," Tow explains. "So Dr. Vernino and I thought, why can't we adapt this to the oral cavity? The tissue bank agreed, so we conducted some studies, and they worked. It was very effective in replacing gum tissue."

Prior to this, gum tissue had been replaced with tissue taken from the patient's palate, creating two surgical sites in the mouth instead of the one resulting from the use of freeze-dried skin.

A technique developed in the late 1960s is used to repair bone loss. A hematologist takes cores of bone from the hip, and these are placed in bony defects in the mouth and permitted to heal.

"This is the best bone-forming material we have," Tow says, "but again, this creates two surgical sites." To avoid the two sites, Tow and others in periodontics have begun using a new material, Durapatite, as bone replacement. "It's the same material as natural bone but it's synthetic — made in a lab. We use it in bony defects, which are like holes in the bone. We haven't been 100 percent successful, but many times we've had some pretty good results."

OU dental students devote 400 curriculum hours to periodontics, which Tow says places the college in the top 10 in the country in clinic time.

Of all the health professions, dentistry has changed the most dramati-



Dr. Michael Rohrer stands beside the microwave oven containing the rotisserie which he and fourth-year dental student Ronald Bulard used in developing a new method of sterilization. OU has applied for a patent on their discoveries.

cally during the past few years. This is particularly evident in dental materials, the area of specialization for Dr. Manville G. Duncanson Jr.

"From a materials science standpoint, there has been great change," he says. "The quality control and the understanding of how these materials behave in the oral cavity have improved markedly."

First- and second-year dental students and dental hygienists are introduced to the materials used for the replacement and restoration of teeth including fillings, crowns, bridges and partial and complete dentures.

One new procedure allows the dentist to microscopically attach filling material to the enamel of a tooth.

"The enamel surface is treated," Duncanson explains, "then the restorative material is applied to it. There is a microscopic mechanical at-

tachment that does two things — helps hold the filling in place and prevents or markedly reduces leakage between the tooth structure and the filling. This is important because significant leakage means the potential for another cavity."

Duncanson says exciting dental materials research is ongoing with respect to the adhesion of filling materials to dentin, the solid material that composes most of a tooth.

"Adhesion is difficult," he says, "because of the complex nature of dentin — it has both organic and inorganic components. I believe in the future, we may see more reliable products that give us real adhesion to dentin."

Duncanson says that the skyrocketing price of gold several years ago caused temporary problems, but gold still is used in alloys for teeth, although other lighter alloys have re-

placed it for many applications such as fixed bridges.

"For a tooth in, let's say, the back of the mouth, where no one can see, we would probably cast a complete gold crown," Duncanson says. "In the anterior (front) of the mouth, we wouldn't use solid gold because of aesthetics."

The aesthetics of teeth — the way crowns and bridges look in the mouth — is Dr. James Kessler's area of expertise.

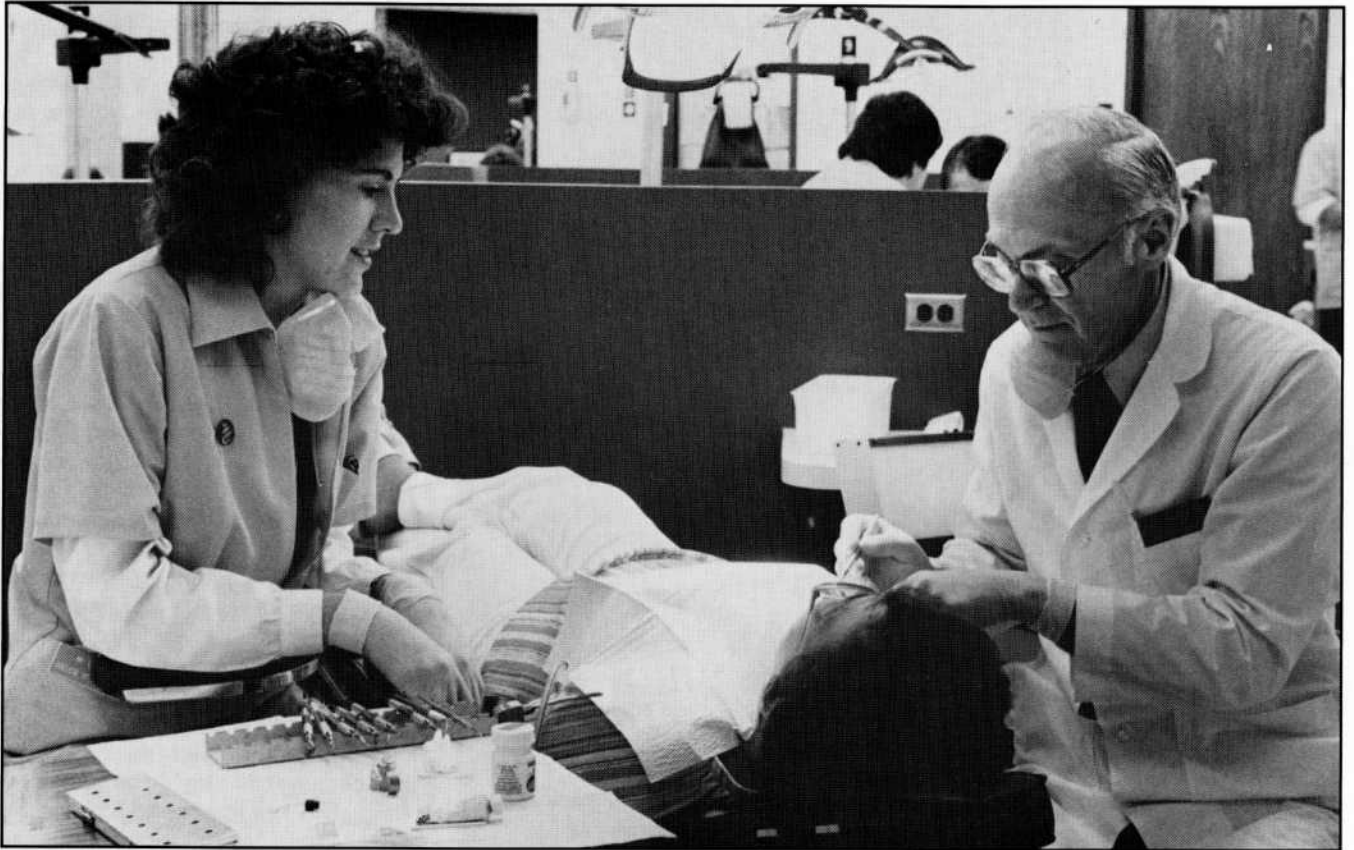
"I found when I was in private practice that one of the more frustrating things was trying to do anterior restorations (crowns and bridges in the front of the mouth) that looked natural," he explains. "After I began teaching, I found this to be an area of frustration for most dentists. So we worked really hard to develop a teaching program for students — and a continuing education program for practitioners — dealing with aesthetic dentistry."

Students spend a great deal of time on crown and bridge work because, Kessler says, it's very demanding dentistry. Unlike some dental schools, OU gives students the opportunity to learn how to build porcelain. Once in private practice they can communicate better with the laboratory technicians who actually fabricate the crowns.

One of the most difficult restorations, according to Kessler, is a single crown. "We're trying to match that single tooth with all those natural teeth," he says. "That's a lot more difficult than matching crown to crown to crown."

In his own practice and in supervising that of the students, Kessler too has witnessed miracles.

"This patient, a 17-year-old boy, had a car accident and had broken two teeth and knocked out two others," Kessler remembers. "Now, he had a world of other problems — subdural hematoma, lost vision in his left eye, left jugular vein cut. He spent five or six days in intensive care. His head was shaved for surgery to relieve the hematoma. All of that, and his major concerns were the lost and broken teeth. We saw him just before Thanksgiving, made him a temporary partial and temporarily rebuilt the broken tooth. And, you know," Kessler smiles, "it was as if there were no bet-



At work in the student dental clinic is Dr. Herman Tow, head of periodontics, and fourth-year dental student Mary Casey of Guthrie. Tow and periodontist Dr. Art Vernino developed the method of using freeze-dried tissue for gum replacement.

ter present I could have given him. Those cases are among the most rewarding."

Another case Kessler recalls involved a girl who lost some front teeth through trauma.

"Because of limited finances, she had to go several years without proper restorations," he explains. "She came to our student clinic, and we installed a temporary bridge. It was just a plastic bridge, but the student did a beautiful job, and it looked really nice. She was just overcome. She jumped up and hugged everybody in the clinic. Our students saw that somebody really, really appreciates what they're doing."

This sense of accomplishment is what drew Kessler to the area of aesthetic dentistry. "It's so important to people."

Perhaps no area of dentistry affects so many people in so many different ways as restorative dentistry, the college's largest division, chaired by Dr. Donald Welk. The specialty includes operative dentistry, fixed prosthodon-

tics, removable prosthodontics, endodontics (root canal work), dental materials, and morphology (the shape of teeth) and occlusion (the way teeth come together).

Welk explains that the students' first exposure to restorative dentistry is in operative dentistry. They begin by filling teeth the spring semester of their second year.

Since there is always a waiting list of patients for the student clinics, Welk points out that patients can be chosen very carefully.

"We have to be selective because many cases would be too complex for the education of undergraduate dental students," he explains. "We try to select patients who provide good learning experiences for the students, realizing that they are not being trained in a specialty."

The education of a dentist does not end when he becomes licensed and enters private practice.

"We have an ongoing program of continuing education," Welk says. "Many

of the faculty members participate, and we also bring in outside speakers — experts in various specialties."

To the layman paying his or her dental bills, dentistry appears to be a most lucrative field, but Welk commented on one rapidly rising operating cost.

"Malpractice insurance in Oklahoma is going to go up something like 300% this year," he explains. "Malpractice suits are more common on the coasts and seem to be increasing in this part of the country." The most common reason for the suits, according to Welk, is reported to be "supervised neglect. Patients did seek dental care, but that dental care did not include everything it should have."

All problems caused by teeth, however, do not always show up first in the mouth. Sometimes, because the teeth and jaws do not function properly, an individual can have pain that appears to be behind the eyes or is misdiagnosed as tension or stress headaches. The proper function of the teeth and jaws is the area of interest and respon-

sibility of Dr. Don Whitsett, chair of the department of occlusion.

Whitsett explains that there can be several causes of jaw difficulties. "One — a faulty bite. An individual's teeth touch on one side, but the other side doesn't have strong, stable contact. So this person clinches his teeth, then relaxes. Clinches, relaxes, trying to establish stable contact." The result is fatigued, painful jaw muscles.

"Sometimes," Whitsett says, "the defect is minor enough that we can mark the areas that hit first, take a burr and grind them slightly. The error may be no more than the thickness of a paper. A second cause can be improperly contoured bridges or crowns which we can replace. And third — we may need to use orthodontics to actually move some teeth and change the bite."

Occasionally a bite defect puts actual pressure on the joints when the teeth are closed, forcing the joints out of position.

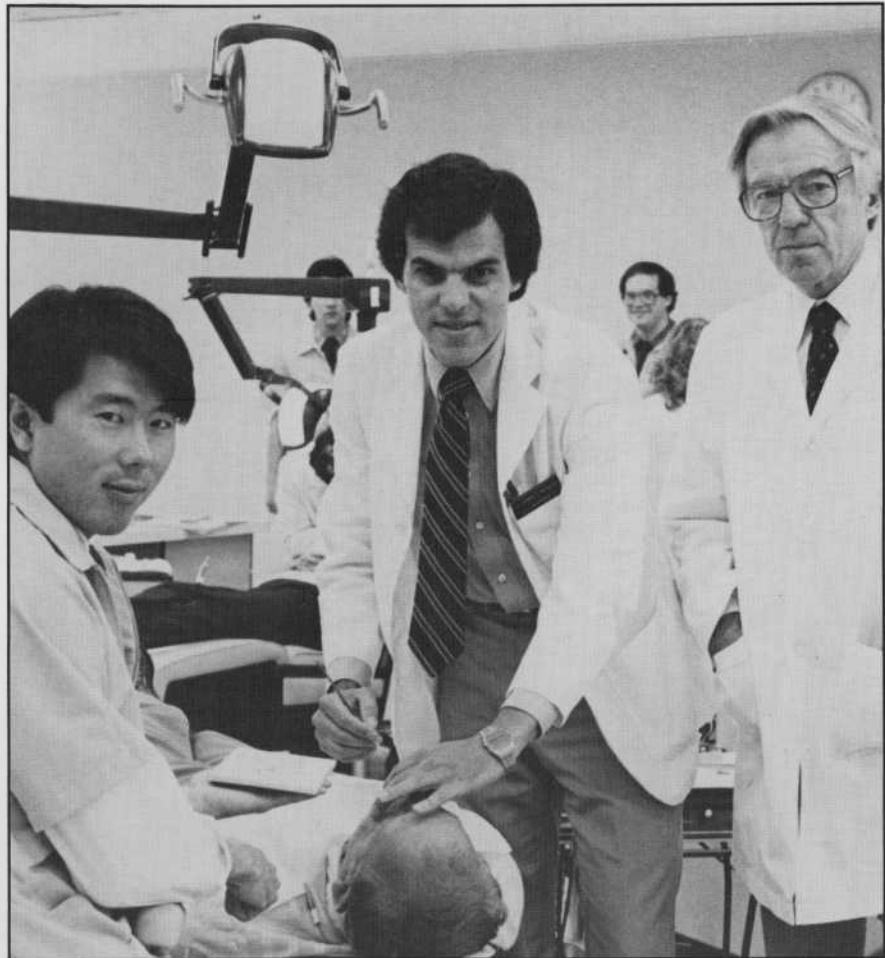
"The pain originates in the joint that allows the lower jaw to move up and down. This joint, right in front of the ear, is like a ball in a socket with a tissue pad that functions like a ball bearing, allowing the ball to move back and forth as the jaw opens and closes. If that ball is not in its optimum position, it can cause pain."

In these cases, the bite has to be changed to de-stress the joint and put it back in its optimum, functional position.

Although the students themselves do not handle the corrective work in such cases, they are being taught to recognize the problems as they arise in their private practices, so that they will be able to get proper treatment for their patients. Whitsett cites continuing education in his specialty as especially important, since it is an area of dentistry where knowledge and skill still are being acquired and perfected.

Acquired knowledge of another sort is the result of the research conducted by Dr. Michael Rohrer, associate professor of oral pathology, and senior dental student Ronald Bulard.

During a class lecture on hepatitis, Rohrer commented that because many plastic and metallic substances cannot be sterilized adequately, a disease



Dr. James Kessler, center, who specializes in aesthetic dentistry, assists dental student Robert Takano of Norman in the staining of porcelain in the student dental clinic as College of Dentistry Dean Dr. William E. Brown observes.

such as hepatitis can be passed from patient to patient or even contracted by the practitioner. During a break, Bulard told Rohrer that he had used microwaves to sterilize tissue culture dishes while working summers at the Noble Foundation in Ardmore.

From these chance comments, a project was born.

Using two standard microwave ovens and a three-dimensional rotisserie they built themselves, Rohrer and Bulard have proved that virtually anything can be sterilized in a microwave oven in about 10 minutes.

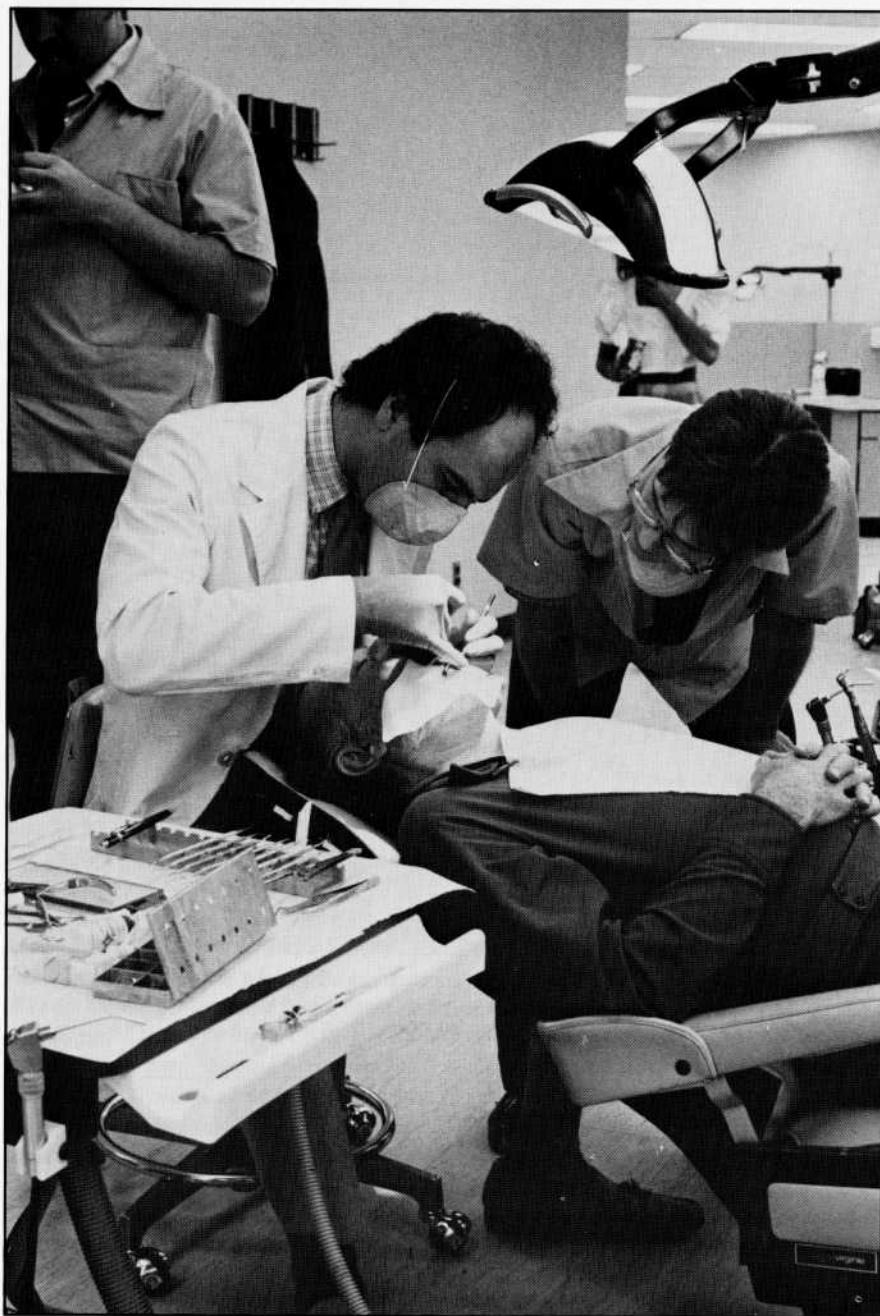
Accomplishing this goal was not simple, however, and Rohrer does not advise attempting to sterilize objects in a microwave oven at home. The initial results of the research were mixed, because microwaves do not spread equally through an oven.

Therefore, the researchers made three-dimensional maps of the hot and cold areas, which led to the development of the rotisserie. The device allows objects to be tumbled and rotated, vertically and horizontally, throughout the microwave oven, resulting in sterilization.

A second problem was the sterilization of materials which are not microwave-absorbent. Operating an oven containing only non-absorbent objects is the same as running it empty, which could damage or destroy the magnetron.

To counteract this effect, Rohrer and Bulard use blocks of a radar-absorbent material recently de-classified by the military for Doppler radar.

Despite what Rohrer described as a "sacred belief that you can't put metal in a microwave," he and Bulard have



Dental senior Winn Ashmore of Oklahoma City, right, observes as instructor Dr. Gary Rahill demonstrates a technique on a patient in the student dental clinic. Although the dental students become progressively more independent in their clinic work, they perform under the close supervision of faculty members.

found that metal, if surrounded by microwave-transparent material such as plastic or glass, can be sterilized in the microwave oven.

"It's not absolutely necessary to surround them," Rohrer says, "but it helps prevent arcing. However, we've found that arcing depends mostly on the shape of the object. Something with round edges won't arc, but something with sharp edges will."


Scientists and engineers disagree on the exact way in which the microwave sterilizes.

"Some say it's the heat," Rohrer explains, "and some say it's the action of the microwaves on the organisms themselves. We don't care. We just know it works, and it's a process that can be useful for sterilizing dental objects."

Scientists and engineers disagree on the exact way in which the microwave sterilizes. "We don't care. We just know it works, and it's a process that can be useful."

The implications go far beyond dentistry. The process could be used for sterilizing everything from the expensive plasma bags used by blood banks to soft contact lenses which wearers now disinfect but cannot sterilize. Possible surgical applications range from eye operations in which a contact lens is stitched into place to the implanting of prostheses. Even plastic "disposables" could be made sterile and reused.

"I talked to an army general," Rohrer recalls, "who said that you could tell where our troops were in Vietnam by following our plastics from our medical supplies. This process would be worthwhile to him if all we could do was sterilize plastic syringes."

You can bet that Rohrer and Bulard will be doing much more with their new process, if only to keep up with their colleagues in the College of Dentistry. Progress is standard procedure here — and who knows? They might come up with another miracle. 

College of Dentistry photos
by Betsy Baker