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TIC

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APRIL 1957 VOL. XVI NO. 4 25c

kasper

health work.

One area of the world, with a population of a half billion, is "heir in abundance" to just about every disease and health hazard known to man.

Malaria attacks three hundred million persons annually.

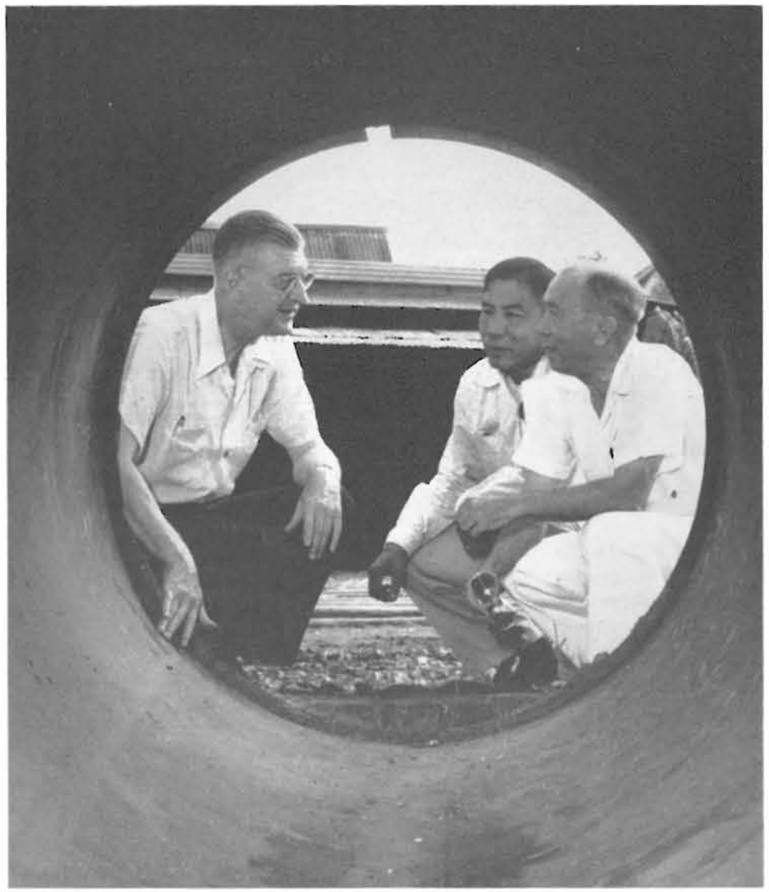
As for mental health, no country is well provided with needed programs of treatment and prevention.

This formidable, yet incomplete, picture of sickness and mortality indicates the size of the health job that needs to be done in the world.

Carl Sebelius comments: "Doctor M. G. Candau, the Director-General of WHO, can, in a matter of minutes, make come alive this whole picture of world health today, and world health as WHO envisions it tomorrow. And he can translate it in such simple terms that everybody can understand it."

And Doctor Sebelius with full conviction concludes:

"All these men and women of good-will at WHO believe firmly, profoundly, with unshaking faith, this: A world of peace and plenty can come only from a world whose men, women, and children are healthy, vigorous, and fit. Every human being on this earth has a stake in such a world. We are starting to build that world, but we cannot do it without your help. This is a task that requires your professional contribution, your professional good-will, your professional faith."



An environmental sanitation program under way in the Philippines.

NEXT MONTH—PART 3



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A MAGAZINE FOR DENTISTS, DENTAL ASSISTANTS, AND DENTAL HYGIENISTS

EDITOR, Joseph Strack
CONTRIBUTING EDITORS
Arthur H. Levine, D.D.S.
Joseph Murray, D.D.S.
ART DIRECTOR, Edward Kasper

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Through the Centuries:

# DENTAL FEES

**Part I**

**by Kurt Proskauer, D.M.D.**

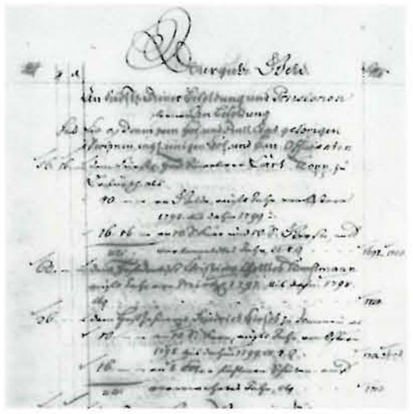
This story is told of a dentist in a fashionable section of New York: After extracting a third molar which had given days and nights of unbearable pain, he was asked by his grateful patient: "How much do I owe you?" The dentist replied: "I'll put it this way: Just give me half of what you would have paid me before the extraction."

This story, however well invented, will not give the future historian any clear evidence of the fees charged for extracting an impacted third molar around the middle of the twentieth century. It will point up, however, the never-changing behavior of man in pain and distress: he is willing to pay anything for relief from his agony; like Richard III, fallen in battle on Bosworth Field, crying out "A horse! A horse! my kingdom for a horse!" The historian will certainly also recognize our dentist's skill in drawing profit from his experience of human behavior and his knowledge of the human psyche.

We, however, are fortunate in having various sources which tell us what sums were asked by or given to dentists in various centuries and in various countries. We have dental bills, ledgers kept by patients and dentists, and documents in the archives of national governments, cities, royal households, and medical and dental societies, as well as an abundant source since the eighteenth century newspaper advertisements of dentists, surgeons, and apothecaries.

It is clear that the fee for dental treatment at any given time and place varies with the cost of living, the purchasing power of money, and the demand and supply, that is, with the relation between the

number of dentists available and the number of persons requiring dental treatment. We must keep in mind that dental treatment before the beginning of the nineteenth century was usually limited to extracting aching teeth, applying medicaments, filing carious front teeth, removing tartar, cleaning teeth, and inserting artificial teeth. But such treatment was available only to the well-to-do and more cultured people in the larger cities, since small cities and villages were visited from time to time only by itinerant dentists, and the need for dental prophylaxis was unknown at that time. Very few people sought dental treatment until they had pain for a long period or suffered from the loss of their teeth. Even then they usually managed to eat without teeth or wore dentures only for esthetic reasons, replacing just the front teeth. Thus the advertisements, even in the first half of the nineteenth century, nearly always notify the public only of the charge for extraction and artificial dentures. The fee quoted—as we shall see later on—was often accompanied by an explanation or comment: from this we learn about the costs of dental care, and also gain much pertinent information which enables us to draw interesting conclusions as to the development of dentistry and its methods and procedures at particular times and places. Some of these advertisements also give us a vivid picture of the social and cultural relations between dentists and the members of their community, especially the medical men. Fee fluctuations are connected with social events and even changes within the dental profession itself.



At the end of the eighteenth and the beginning of the nineteenth century the small grand-ducal court of Sachsen-Weimar—where at that time the great Johann Wolfgang von Goethe lived—had employed for many years the services of a **Hofdentist** who seems to have been a kind of dental technician, as well as a **Hofzahnarzt**, a court dentist.
The **Hofdentist** Christian Gottlob Kunstmann received for his services in the year "from Michaelmas 1797 until Michaelmas 1798" 60 **Reichsthaler** ($45); the **Hofzahnarzt** Friedrich Hirsch, 10 **Reichsthaler**, 10 **Scheffel** (about 15 bushels) of corn and 8 cords of pinewood for his services rendered "from Eastern 1798 until Eastern 1799."

The earliest specified dental fee is one I found in the medical budget of a patrician household in Augsburg, Germany. The head of this household, Behaim, recorded on January 23, 1568: "Master Nicholas, the barber surgeon, came to my wife for several days when her cheeks were so badly swollen. I honored him with two pounds, twelve pfennig." The entry closes on a rather apologetic note: "He did not want to take any more."

Other early sources of data on dentists' earnings—not the fees they received for specific individual treatments—are the household books of princely courts and the budgets of larger cities which employed dental services. These documents show in most cases only the total sums received by court- or city-dentists (a kind of official) as fixed salaries. They were paid either money or agricultural and natural products such as firewood, corn, wine, clothes, and woven material. Besides this fixed salary, court-dentists sometimes also received fees for toothpowders, mouthwashes, and other toilet articles of all sorts, cosmetics and perfumes, and medicines they prescribed and compounded themselves for the princely family.

The kings of France and families consulted physicians, surgeons, and barbers, favoring those among their court-surgeons who specialized in treatment of the teeth and diseases of the mouth. After the official position of the *Operateur pour les dents du Roi*—Operator on the Teeth of the King—was created in 1669 at the court of Louis XIV, the court-dentist was also appointed to the other members of the royal family, and his income thus reached a high figure at times. The first to hold this position—from 1669 to 1674—was the barber to the King, Francois Le Bert. He received 1,200 livres a year. His duty was "to clean and cut the teeth and furnish the roots and opiates when the king washed his mouth." The barbers of the King, who brushed his hair morning and night, wiped him dry after his bath, and cleaned his teeth, received from 600 to 800 livres a year in 1663, three years before the barber Le Bert became Operator on the Teeth of the King.

That the fee paid to the dentists by the princes must have been very generous can be concluded from a passage in the work of the French surgeon Pierre Dionis, *Cours d'opérations de chirurgie*, published in Brussels in 1708: "The instruments for cleaning the teeth are usually made of steel, but those used on the king and princes are of gold. If there was a more precious metal, the dentists would use it, because they are so magnificently rewarded." The salaries



Headquarters of WHO, Palais des Nations, Geneva.

One might be inclined to observe that this is an unrealistically comprehensive program and to point out that two-thirds of the men, women, and children of the world live in underdeveloped areas where life expectancy at birth is only thirty years. Great numbers of people in these countries are unable to read, are guided by ageless prejudices, and are motivated by pathological fears. One might add that it is impossible even to plan any kind of educational program that could reach these groups, communicate with them, help them to recognize, understand, and accept what is expected of them. After all, almost one and a half billion men, women, and children live under conditions that make sickness and undernourishment the *normal* state of life.

The struggle to survive amid poverty and overcrowding is still the rule for most of the world's one billion children.

Almost 80 per cent of the world's population does not have a reliable water supply. They live with fouled rivers, polluted springs, dirty canals, infected wells. In India alone it is estimated that water-borne diseases every year sicken fifty million persons and kill two million.

Fifty million people in the tropics suffer from yaws, which is caused by a spirochaete similar to that of syphilis. About eight million are lepers.

One country, with a population of more than a million persons, has only one physician and one dentist.

Another country, with a population of three and a half million, has only six persons trained in public

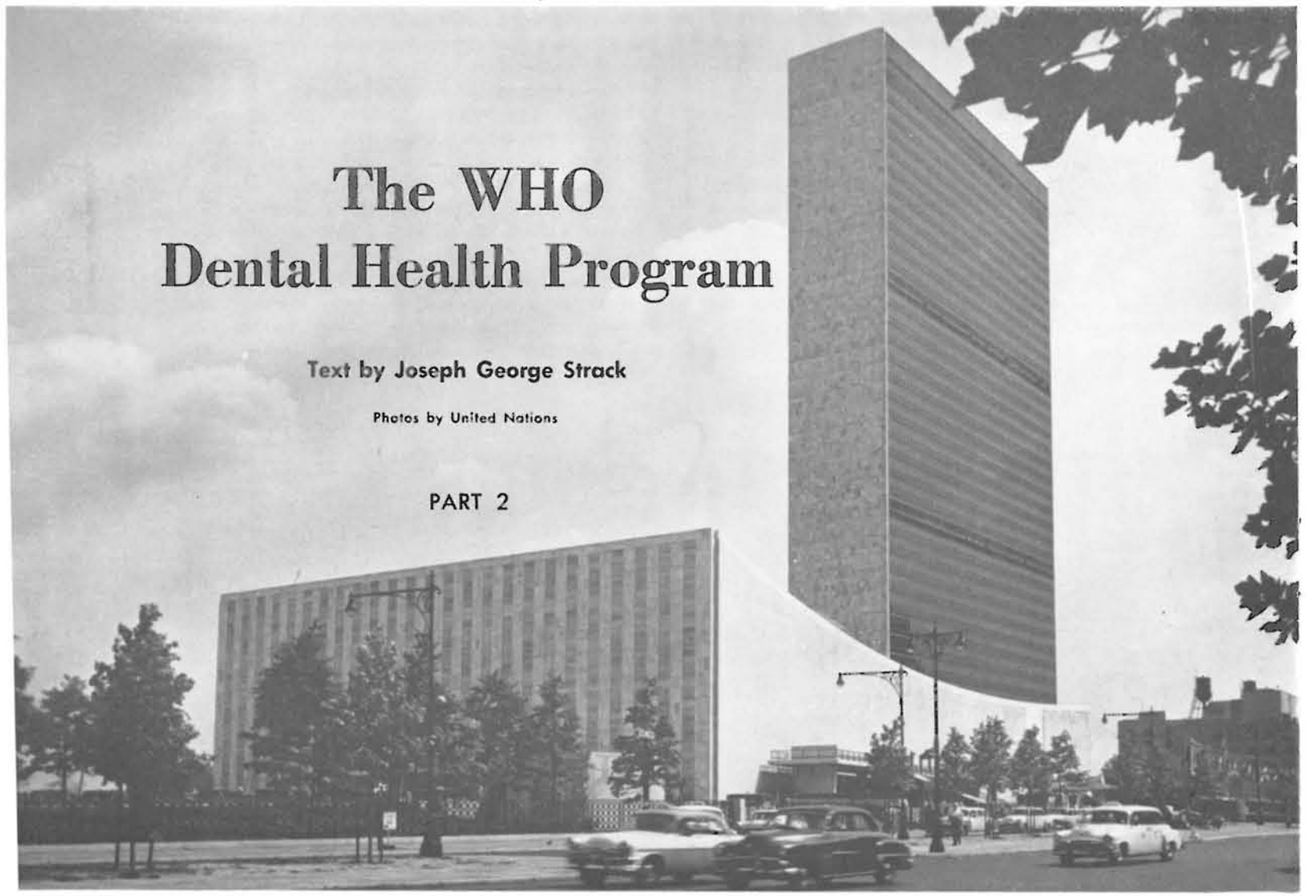
Doctor Carl L. Sebelius, WHO's Dental Health Officer.

Doctor Carl L. Sebelius, Dental Health Officer of WHO, the health agency of the United Nations, has promoted dental activities in Tennessee for a number of years. Today, with the help of dentists and persons interested in dental health, he hopes that a gradual improvement of the dental health of all people can take place.

The dental health of most of the two and a half billion men, women, and children in the world is poor. Practically all of the young people in the highly developed, industrialized countries are attacked by dental decay. In the older groups, the widespread incidence of periodontal diseases is an added oral burden. In some areas of India almost everyone suffers from diseases of the periodontal tissues, even in young children. Thus hundreds of millions of men, women, and children in all the nations of the world require dental services, both treatment and preventive. But they need much more.

The realization of health in the world community, as in any local community, is not the product of a single approach, such as merely combating disease. It is a "bold and complicated purpose" that involves a wide variety of efforts to produce many factors which go to make up health—good food, good housing, good sanitation, good public services, a high level of national productivity, an adequate system of education, good relationships between people.

Headquarters of the United Nations in New York.



# The WHO Dental Health Program

Text by Joseph George Strack

Photos by United Nations

PART 2





allowed to royal dentists were indeed very high. The practice of King Louis XIV's dentist, Dubois-Guerin, who held the position from 1676 until 1708, is estimated to have brought him 5,393 livres a year, an enormous sum for that time.

There are some interesting items on dental care in the accounts of the French King Henry IV: in 1576, exactly one hundred years before Dubois-Guerin became dentist to Louis XIV, he spent twenty sous a month for toothpicks, and in 1581 for "gold to fill the teeth of the king 15 livres, 15 sols," a livre being about equal to our present 20 cents, divided into 20 sols or sous.

For the year 1789 we have documentary evidence of specific fees paid by Louis XVI to the Parisian dentist Etienne Bourdet, who was dentist to the royal household and served not only the ill-fated King and Queen Marie Antoinette, guillotined in January 1793, but also the King's brothers, the future Kings Charles X and Louis XVIII; the King's sister, Elizabeth; and the King's two sons, the young Louis Joseph and the future Louis XVII. In 1789, the year of the outbreak of the French Revolution with the storming of the Bastille, Bourdet received the following sums for his dental work on these members of the royal family:

Reimbursement of expenses during his voyages in the retinue of the king . . 3,500 Livres
Reimbursement of travelling-expenses in connection with treatment of the king and the royal family . . . . . 2,000 Livres
Services rendered to the Queen (Marie Antoinette) :
Reimbursement for his absence from Paris . . . . . 2,000 Livres
Reimbursement for expenses and compensation for treatments . . . . 1,000 Livres
Services rendered to the Dauphin (the later Louis XVII) . Treatment started May 1st, 1787 . . . . . 1,000 Livres
Services rendered to Madame Elizabeth (sister of King Louis XVI) :
Reimbursement of expenses and fee for treatment . . . . . 1,000 Livres

In 1800 the surgeon-dentist to Napoleon, Jean-Joseph Dubois-Foucou, received 280 francs for the mouthwash and opiate he had made for Napoleon's wife, the future Empress, for the same cosmetic and medicine he received 216 francs in 1801; in 1802, 340 francs; in 1803, 312 francs; in 1804, 292 francs; in 1805, 234 francs; for the half year of 1806, 181 francs. For his visits and treatments of the Empress in the Palais Luxembourg, in the Tuileries, and in Saint-Cloud he got 800 francs and—here for the first time we find a fee for a specified treatment—400 francs for treatment of the fractured jaw of one of the Empress' postilions, caused by a blow from a horse's hoof. From 1814 on, Dubois-Foucou received the fixed sum of 6,000 francs a year for treating the Emperor.

In 1815 the famous Italian inventor of single porcelain teeth, Giuseppangelo Fonzi, was called to Munich by the King of Bavaria, as Guerini reports in his *Life and Works of Giuseppangelo Fonzi.* He was assigned an apartment in the royal palace and lodged and boarded there for four months; during this time he treated the King and royal family and other great personages, to the complete satisfaction of all. Besides his large pecuniary compensations, he received magnificent presents and also had the honor of being appointed dentist to the King of Bavaria. After 1816 Fonzi was twice "called to Madrid by the King of

## THE HAPPY DENTIST

Notice that I'm bright and gay,
Jovial in the things I say,
Haven't got a single gripe?
Think I'm a peculiar type?

Mark me that I seem to be
Easy-going, calm and free,
Never nervous, quick, or short?
Figure I'm a funny sort?

You other dentists round-about now,
Harrassed-looking, scrape and bow,
Wait for patients for your chair
With a faintly eager air—

You other dentists mail out bills,
Start to taking your own pills,
Scan your patients' pocketbooks
With some hopeful, anxious looks—

I'm the one who can pick up
The check for coffee in a cup!
I'm the fellow full of cheer
Although middle April's here!

All you men with profits high,
Look at me, and don't think I
am not enjoying—while I can—
Being a lower-income man!

Helen Harrington

Spain, whom he treated with great success, thus obtaining still more renown, not to speak of the material profits derived from the regal munificence." In 1823 Fonzi went to Russia, where he stayed about two years. He had been named Surgeon-Dentist to the Imperial Court. The Queen "was so satisfied with Fonzi's work that she continually made him presents of great value."

In the summer of 1825 Fonzi was called to Madrid for the third time by the King of Spain. A special courier accompanied him to Spain at the King's expense, and at the frontier a military escort, by order of the King, awaited him and accompanied him to Madrid, where an apartment in the royal palace was placed at his disposal. He remained in Madrid about seven months. The King much satisfied with his services, named him Dentist to the Court and conferred on him a pension of 1,000 ducats per annum, a very considerable sum for those days, "approximately $2,800," as Bremner says, "but the equivalent of six or seven times as much in present day purchasing value."

## Researching a New Speech Aid

Research under way at Northwestern University's Cleft Lip and Palate Institute may result in a new speech aid not only for cleft palate patients but for bulbar poliomyelitis patients as well. Designed by Doctor Morton Rosen, assistant professor of prosthetic dentistry, the appliance, much like a dental plate or bridge, has been used successfully on bulbar poliomyelitis patients.

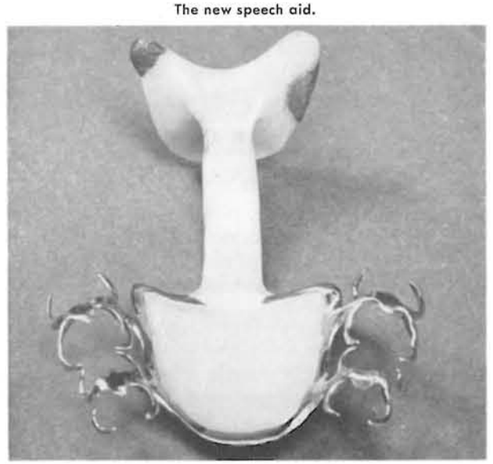
These patients are often left with a speech defect sounding like that of the cleft palate victim. The reason for this is that those with bulbar poliomyelitis often have a paralyzed palate and are no longer able to keep air from going up through the nose.

Once they have recovered from the acute state, the victims' greatest residual defect may be the speech impairment. Because the soft palate is paralyzed, the sound goes through the nasal cavity and the voice then has a nasal sound just as in persons with cleft palates.

The prosthetic appliance, which is a modification of the one designed for cleft palate patients, covers the soft palate and blocks off the nasal cavity. It is attached to the teeth much like any other dental prosthesis.

According to Doctor Rosen, this represents an important step forward in the treatment of bulbar polio patients who have been left with a speech defect. He emphasized that with the appliance there is some immediate benefit but that it must be supplemented with speech therapy.

The new speech aid.



Former polio patient with a paralyzed soft palate.





had the choice again, I would pick a career which allowed more time for marriage, home life, and children, much as I have enjoyed my years of dental practice."

It has been a strange anomaly that, although Doctor Hazel Merrick has no children of her own, she has had the rich and worthwhile experience of devoting more than thirty years to the improvement of the dental health of the children in the community where she lives. Her dental ancestors could surely find no fault with the manner in which she has carried on the family tradition.

P.O. Box 350
Albany, N. Y.

## The Panoramic X-Ray Machine

**Photos and text by Authenticated News**

A new dental device that photographs all of a patient's teeth in one exposure has undergone tests at Lackland Air Force Base, Texas.

The device, called the panoramic X-ray machine, was developed by the dental section of the National Bureau of Standards, with the cooperation of the Air Force Dental Service, and the School of Aviation Medicine at Randolph Air Force Base, Texas.

Its principal inventor is John W. Kumpola of the Washington, D. C., agency. He assisted Lt. Col. Russel Butler, head of the Lackland Dental Processing Section, in testing the instrument on Air Force trainees.

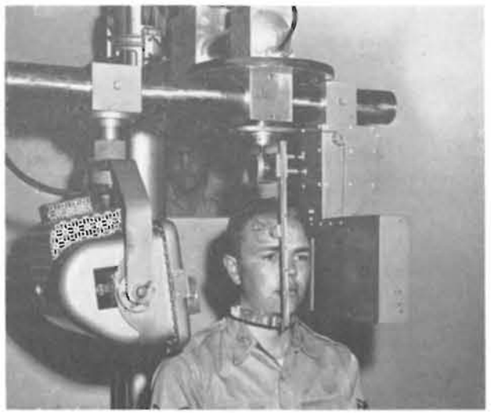
The machine differs from the usual dental photographic equipment in that a film holder and the X-ray source, mounted on opposite ends of a thick, metal arm, travel in an arc around the patient's head. The film, moving in front of the subject, is exposed when X-rays pass through the back of the head.

Thus, in a matter of seconds, a complete picture of a patient's dentures is available to the diagnostician. Heretofore, a skilled dental technician, working with standard equipment, took twenty minutes to perform the same task.

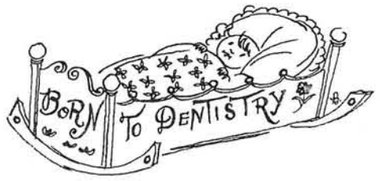
Smaller operational costs and controlled exposure to harmful X-rays for the patient are other important features of the new device.

A predental student who became interested in the mechanical aspects of the field, Kumpola began work on the panoramic X-ray machine in late 1954. For a time, the Air Force officer in charge of the project, Col. Donald C. Hudson, now chief of the Research Dentistry Division at the School of Aviation Medicine, aided in the early stages of the machine's construction. Kumpola expects to have the machine ready sometime this year for wider use among the armed forces.

Inventor John Kumpola, center; Lt. Col. Russel Butler, right; at extreme left, a dental technician.



Airman seated in the new machine.




by Kay Lipke

What are the early qualities which go to make up a woman dentist?

What impelling force early in life so captures her imagination that she willingly turns aside from the usual feminine activities, and makes the big decision to join the ranks with the men in the long arduous years of dental preparation?

Most amazing of all, whence comes the curious tenacity which can keep a woman dentist dedicated to her profession all through her life, with not even marriage and home interests turning her from her course?

These questions were answered for me the other day when Doctor Hazel Merrick and I had a stimulating two-hour visit, during which I fired questions and she fired interesting answers right back at me.

Doctor Merrick—who is so femininely attractive that "Hazel" suits her more than the formal "Doctor Merrick"—was one of two girls in my husband's dental class at the University of Southern California. She loved dentistry then, and she loves it today. She was the wife of a prominent dentist, Doctor David McLean, until his death a few years ago. At one time they had practiced together in Arcadia, near Los Angeles, and Doctor Merrick still has her office there.

In a sense, Hazel Merrick was born to dentistry. Not only were her grandfather and grandmother dentists, but also her father, her father's uncle, his brother, and a nephew. The family hoped she would be a boy to carry on the tradition, so her destiny was charted in advance. She never thought of any other career. Even her highschool compositions were on dentistry.

When young Hazel Merrick entered dental school, she dreaded the study of anatomy, but soon found that her interest in the subject outweighed any feminine squeamishness. Everything about dentistry fascinated her.

Upon graduation, she entered her father's office, but soon had an opportunity to join the Los Angeles Department of Health as a dentist, examining the teeth of school children and doing dentistry free for those who could not afford a private dentist.

Doctor Merrick loved working with children and entered this work with great dedication, remaining with the health department for over twenty years. In 1927 she was appointed chief dentist with twelve dentists and five dental hygienists under her supervision. She weathered the depression, with its serious budget cuts in her department, by putting everyone on halftime service, determined not to part with her valued personnel nor to imperil the important dental work with children which she had built up so carefully.

Those were the pioneer days of dental health for children, before the American Dental Association made dental health education such an important part of its program, and before the toothbrush people promoted the cause of constant tooth brushing through every magazine, radio set, and television screen.

It has been interesting for Doctor Merrick to watch the advance in dental health education through the years, but occasionally she becomes discouraged with parents who deplore their children's cavities and promise full cooperation while in her office, but are seen later at the neighborhood market with a new supply of candy bars for their offspring. "And they know that sugar is the big bad wolf," she said despairingly.

In 1945 Hazel Merrick resigned from the county health service to enjoy her home, her dentist-husband, and their mutual hobby of raising rare plants. In time, however, she discovered that she was restless at home and missed her active professional life. She also found she was a much less efficient housewife than during the years when she went to her office each day.

When her husband suggested that she come to his office and practice children's dentistry, she accepted gladly, and that was the end of her retirement. A great bond between Hazel Merrick and her dental husband was their mutual interest in camellias and cymbidium orchids. Doctor McLean became quite an authority on these rare plants and since his death a beautiful white cymbidium has been named in his memory. It has been awarded many prizes.

Hazel Merrick is a vital, attractive woman of many interests, the foremost, of course, being dentistry. However, she confessed to me that she would not choose to become a dentist if she were doing it again.

"Dentistry is too absorbing, and can twist a woman's life all out of shape," she said seriously. "If I





*Don't Keep Patients Waiting:*

Two dentists, one in California and the other in Pennsylvania, although separated by nearly three thousand miles, have arrived at nearly identical solutions to the problem of meeting the appointments of patients "on the dot" so as not to disrupt the social and business schedules of these men, women, and working teen-agers.

The attention these men are giving this phase of their practices also applies to dentists in other parts of the country, as evidenced by the recent comments of a Florida specialist. His work is limited to prosthodontics, which requires that he see fewer patients than dentists in general practice. Nevertheless he claims: "I have always felt it is just as important for the dentist to be punctual for appointments as it is to expect the same of patients. A mutual respect for each other's time is essential in building and maintaining a successful practice."


This reference to mutual respect has been echoed in the remarks of dentists in New York, Ohio, Virginia, and Illinois, with each insisting that the efforts made in dental offices to get patients to arrive on time is more successful when the dentist operates on an exact schedule. A Wilmington, Delaware, practitioner had this fact brought home to him when a broker with an office just down the hall arrived fifteen minutes late for a mid-afternoon appointment. "I didn't expect to find you ready for me," the business man explained. "The last two times I spent ten to twenty minutes reading your magazines."

In the practice of Doctor William S. Miles, Jr., of Glenside, Pennsylvania, such happenings are held to a minimum, since he has set aside a "buffer" period each morning and afternoon. This procedure follows a pattern similar to that of Doctor Allyn S. Abramson of Los Angeles, in that both men allow a half hour from ten-thirty to eleven and from three to three-thirty to "catch up" when earlier appointments run beyond their scheduled periods. This hour each day, however, is by no means non-productive, since, as Doctor Abramson explains, it can be devoted to emergency cases, laboratory work, or preparing for future patients. Also, with the consent of the patient in the chair at ten-thirty or three, the appointment may be lengthened if there is no other demand for the dentist's attention during the "buffer" half hour. Doctor Miles, who practices in a suburban area, has given this subject of timing considerable thought and in making an appointment he does not limit his instructions to the arrival time but also mentions how long he expects to keep his patient in the chair. "In this way," Doctor Miles points out, "a patient is left free to schedule business or social appointments with assurance that he will be in a position to keep them. On occassions when he runs into some unanticipated problem that delays his operations, it is Doctor Miles' practice to telephone the patient who has the next appointment and explain that he will be delayed. If the delay does not interfere with that patient's plans, he is free to come in as scheduled and wait. Otherwise another period is arranged.

This emphasis that so many dentists are now placing on accurate scheduling of patient arrival and departure is closely linked with the current high employment figure. While this same condition has contributed to a stepped-up demand for dental services, it has also attached a dollar importance to dental chair time entirely unrelated to professional fees. In many homes both the father and the mother are employed and even the teen-age children are likely to have part-time, after-school jobs. Except for those working in executive positions, time lost from the job means a reduction in income, and even among the self-employed and others who are "on their own," time is measured in dollars and cents. Thus we have this trend toward increased consideration for patients with demanding outside interests.

This development is also responsible for the special attempts of dentists, such as one Atlantic City, N. J., practitioner, to funnel non-working wives into mid-morning and mid-afternoon appointments. "I have found," he said, "that employers are more willing to give employees an extra half hour at the start or close of a working day or around the lunch hour than at any other time." By leaving open the "ends" of his morning and afternoon hours, and scheduling women and others who are free for the in-between periods, his job of keeping appointments on time is simplified considerably. This in some respects is comparable to the efforts of Doctor Alfred Barnett of Havertown, Pa., to set up a "Children's Hour," as described in February 1956 TIC. By leaving the periods of heaviest demand for patients with limited time, these dentists have found that even a tight working day can be run off with relative smoothness

and with less possibility of complaints from time-conscious patients.

Among those dentists who have succeeded in adding a higher degree of exactness to their appointments several admit that the task was simplified by first searching out the root of the problem. As a Philadelphia dentist explained, "I had to learn to say no when asked to sandwich a patient into a schedule already crowding my physical and professional capacities." This seems like a simple accomplishment until it is recalled that veterans and newcomers to the field fall into the habit of accepting too many patients for understandable reasons. The older man may have had periods when calls from patients were so infrequent that his appointment book had a discouraging number of blank spaces. He has never gotten over the desire to keep that book filled to capacity, so he takes on more than he can handle with satisfaction to himself and his patients. The younger man on the other hand, in his anxiousness to create acceptance and build an active practice hurriedly, believes that he cannot afford to say no. But as the Philadelphia dentist points out, "A patient quickly forgets that it was necessary for his dentist to delay an appointment for several days or even several weeks, but he clearly remembers the promptness with which a dentist meets a scheduled appointment and the efficient, unhurried attention he received while in the chair."

The step-up in satisfaction and the good-will developed by promptly meeting each arriving patient are, according to reporting dentists, accompanied by a reduction in nervous and physical strain. And the wife of one dentist added her non-professional okay when she commented: "Phil and I and the children are now eating dinner at dinnertime." Which in itself is an advantage of no mean importance.

In summary then, here are five basic steps to take, doctor, to avoid complaints about appointment delays:

Except for emergencies, be definite in rejecting requests for appointments during an already crowded day.

Allot extra time for treating the timid patient, or when scheduling time for a possible problem case.

Set up "buffer periods" morning and afternoon to care for emergencies or to provide for operations that run past anticipated appointment time.

Include both arrival and departure times when scheduling patients' visits.

Explain your timing procedures to patients. It encourages their cooperation.

1007 North 64 Street
Overbrook, Philadelphia 31, Pa.

File-size folder designed by Doctor George S. August, Silver Springs, Md., to hold case history, X-rays, and other material.

| PATIENT'S NAME | RESIDENCE PHONE NO | RESIDENCE STREET ADDRESS | TOWN | STATE |
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| | BUSINESS PHONE NO | BUSINESS STREET ADDRESS | TOWN | STATE |

PATIENT'S BEST TIME _____

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| No. | DR. & TIME REQ'D | OPERATION | INTER-VAL | NEXT APPOINTMENT |
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The dark beads represent a mono-esterified monomer such as methyl methacrylate, united in such a manner as to produce linear macromolecules. The double molecules connect two chains in such a way that complex chains are formed which resist deforming and disrupting influences in a manner proportional to the amount of cross-linking monomer present in the mixture. One chain (upper left) is shown representing complete linkage; others show partial linkage due to incomplete polymerization of one of the two constituents.

The foregoing discussion makes no attempt at an authoritative explanation of a very complex phenomenon. It is, however, a method of visualizing it.

933 Ridge Avenue
Pittsburgh 12, Pa.

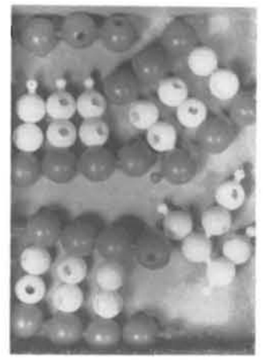

Figure 9. Cross-linking of linear molecules, complete and partial.

## SPRING EXERCISE

Oh, wife, dear wife, you know it's spring,
The time is almost here—
Look up my hiking shoes; and bring
Forth all my fishing gear!

Put out my book on birds, and my
Binoculars go find.
You're beautiful. You satisfy.
You understand. You're kind.

This chair has tied me all year long.
I vow I'll hurry out
Where there is grass and sky and song
And I can tramp about.

Exercise! It's what I crave.
I must grow lean and hard—
But, darling one, what do you have
There, standing in the yard?

Lawn mower? Oh. And can't I see
The grass is tall? (Can't win!)
Confound! I'm tired! Besides, praise be!
Here's a patient coming in!

H. H.

## *THINGS TO DO*

For years I had been plagued by slipping cotton rolls when placed on the lingual side of molars and the bicuspid area of the lower. I used clamps but they were uncomfortable to the patient. I happened to remember the stickiness of a denture powder that I used quite often. I sprinkled some of the powder on a cotton roll and put the roll in place. It stayed right where I put it, saliva had no effect on it, and it did not loosen.

After I have polished out the scratches and the washboards of acrylic dentures to give the finished work a high polish, I make a rather stiff paste of whiting and glycerine. I then use a soft rag wheel brush on my lathe which has had the paste rubbed into it. This gives the denture the high polish everyone likes to see. The excess paste left after polishing can be washed away quickly by holding the denture under the cold water faucet.

To amuse my small-fry patients I make whistles for them from empty anesthetic carpules. The tone of each one depends on how far down in the glass the stopper is pushed. By blowing across the top, the whistle sounds. I set the carpules in soft plaster (rather my assistant does) so that no youngster can accidently swallow one. They are set in a series of six different tones, from low to high. R. B. M.

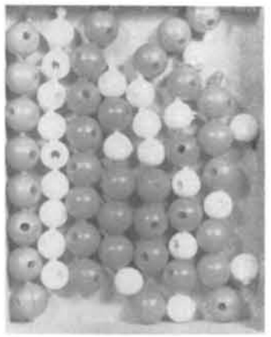

Figure 6. Several types of co-polymer chains.

they have similar polymerization characteristics as regards catalysts, temperature, and time.

In Figure 6 we illustrate some of the possibilities of co-polymerization of monomers A and B as illustrated in Figure 5. A may chain only with A, and B may chain only with B. Chains may form according to some regular pattern such as A-B-A-B-A, or AAA-BBB, or B-A-B-AAA-B-A-B, or almost any conceivable arrangement depending upon the percentages of A and B, with a certain number of uncombined molecules of each constituent. Co-polymerization, while attractive in theory, often fails to work out in practice, since some monomers prove to be mutual inhibitors when mixed, or one monomer may polymerize, and the other fail to do so. Our efforts to impart some of the good properties of each resin often result in a "gunk" having the good properties of neither of its constituents.

## Cross-Linked or Tridimensional Polymers

For the most part we have limited our discussion to linear polymerization, with a brief reference in the cases of condensation and vulcanization to polymerization of three-dimensional molecules. There are, however, numerous organic compounds which undergo true polymerization to form molecules which grow in three dimensions. The resulting polymers are insoluble and infusible. They can be destroyed by heat or by chemicals, but cannot be rendered workable by heat or chemicals used alone or in combination. Most of the true tridimensional polymers have no industrial value in the pure state, for they are weak and brittle. They are not suited to casting since the polymer is not soluble in the monomer, and hence they are lacking in Gel-strength. Some of these monomers are used as co-polymers to form "cross-linked" resins where they contribute some measure of heat- and solvent-resistance. The value of these

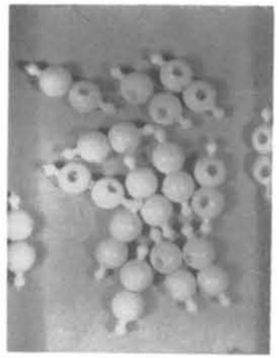

Figure 7. Cross-linking monomer molecules.

cross-linkers in denture base may be questioned, but their value in plastic teeth has been demonstrated.

Here we have constructed cross-linking molecules by connecting the receptor ends of two Poppit beads, and by drilling them laterally we have added four receptors.

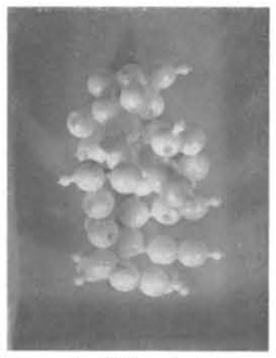

Figure 8. Tridimensional macromolecule.

In Figure 8 a number of the molecules as shown in Figure 7 have been snapped together to form a space model having length, breadth, and height. A large space model constructed in this manner would lack the adaptability of an equal number of beads grouped in long or short chains. Its response to deforming stresses would tend to brittle fragmentation rather than the breaking of some chains and displacing of others as would be the case if the mass consisted of a myriad of linear chains.

In Figure 9 we attempt to illustrate a possible cross-linking of a straight chain polymer with a polyesterified monomer such as ethylene glycol dimethacrylate.





# Angles and Impressions

by Maurice J. Teitelbaum, D.D.S.

### *Dental Thisa and Data*

Research in the transplantation of teeth is being carried out in Michigan by Doctor James K. Avery. Although still in the experimental stage, they plan to establish "tooth banks" throughout Michigan and have oral surgeons operate the banks in their areas. It sounds plausible as far as the oral surgeons are concerned—no other dentists are more familiar with withdrawals. . . . Of the fifteen prize hints chosen by the Homemakers Forum of the United States and Canada, at least two might have been dreamed up by some dentist or dental assistant. For example, one of the hints suggests the use of dental floss instead of cotton thread in sewing buttons on garments that keep loosening or coming off. The other suggestion might have some merit even in a dental practice—with some variations. It suggests the use of lollipops as tongue depressors when looking into a small child's mouth. There's little doubt that a clear view of the mouth and throat can be obtained in this manner without any strenous objection from the child, especially if you sort of move the lollipop around a bit over the tongue. Some sugarless lollipops might be handy in the dental office as cheek retractors for the little tots instead of so surgical looking an instrument as a shiny mirror.

### *Quotes and Queries*

One of the popular periodicals noted this interesting sign in a doctor's waiting room: "Ladies in the Waiting Room Will Please Not Exchange Symptoms. It Gets the Doctor Hopelessly Confused." . . . Grammatically speaking, split infinitives are frowned upon but split sentences can cause quite a chuckle. Just the other day a dentist showed me the following note from a parent who wished to give permission for an extraction for her child under nitrous oxide. Said the note, "You have permission to take my sons tooth out. He was up all night, with gas." . . . Have you heard about the rich Texan who has a different dentist for every tooth?

### *Human Relations*

For a good short course on human relations the following from the *Waterton News and Views* packs a lot of sense:

1. Five Most Important Words: I AM PROUD OF YOU!
2. Four Most Important Words: WHAT IS YOUR OPINION?
3. Three Most Important Words: IF YOU PLEASE!
4. Two Most Important Words: THANK YOU!
5. Least Important Word: I

### *Inci-dentals*

Usually, in comparing dental fees of past years, we find that today's fees are the highest. However, a British dentist, Doctor Martin Van Butchell, got $500 for a set of dentures back in 1830! . . . The most useless bit of information we received in our mail recently comes from a large concern's periodic bulletin: "One or two injections of iminodiproprionitrite will cause mice to run continuously for the rest of their lives, except when they eat or sleep."

446 Clinton Place
Newark, N. J.

# POLYMERIZATION

by H. M. Vernon

An acrylic resin, methyl methacrylate, was introduced as a denture base in the latter part of the Nineteen Thirties, and with it was introduced to dental science "polymerization." The curing or processing of rubber was called vulcanization and the curing of the phenolic resinoids was termed condensation. The curing of the acrylic resins, however, is polymerization.

The visible result in each case is the same: a soft material is converted to a much harder state by heating under pressure. The changes effected in the molecular structure bear a superficial resemblance. In vulcanization, a new grouping of rubber molecules is effected by the reduction of sulfur to sulfides, with changes in the atomic structure of the rubber molecule. In the type of curing known as condensation, a polymeric type of molecule is formed by the uniting of two differing molecules. At the same time, some atoms are eliminated by combining in a simpler molecule such as water. In each of the above reactions, irreversible changes are involved, and the original monomeric substances cannot be easily regenerated. In each of the above cases the type of polymeric molecule formed grows in three dimensions, length, breadth, and height. The three-dimensional polymer, however, is not peculiar to vulcanization or condensation.

Polymerization may be defined as "a union of two or more similar molecules in which the atoms remain in similar relative positions" (Hackh's *Chemical Dictionary*) and: "The new molecular weight is a multiple of that of the original compound. From the polymer, the original substance may or may not be regenerated." The macromolecule may grow in one dimension as a linear molecule, or it may be a complex molecule of three dimensions. Either the linear molecule forming the thermoplastic resins, or the three-dimensional molecule of the thermoset resins may be formed as a result of true polymerization, depending upon monomer used.

No one has seen a molecule; it is probable that the molecule does not exist as a tangible object. We can leave its spatial existence to the theorists, for the molecule behaves like an object having a discreet form, and in order to diagram its behavior in certain cases, we will for the purposes of this discussion assign it physical form and substance. Circumstantial evidence exists that the linear molecule of a thermoplastic polymer has a filamentous form, and that its resistence to stresses and solvents is directly related to the number of monomer units composing it.

For the purposes of illustration we can also consider the methacrylate monomer molecule as having a "head and tail," and the molecules link head to tail during polymerization. This view is not wholly accepted by the theorists, but it will serve our present purposes. The statement will also be made that each chain whether long or short will have one, perhaps two ends which are vulnerable to solvents and to other destructive forces, and the greater the number of ends, as in short chains (lower molecular weight polymers) the greater the vulnerability of the polymer to agents which cause changes in the material.

In order to visualize polymerization we can use diagrams, drawing hypothetical molecules, or structural formulae, where the monomer molecule is illustrated combining carbon to carbon.

For the present article, Poppit beads were used. These beads, made of polyethylene, can be bought at almost any novelty counter. Red beads (gray in the photographs) were selected to represent methyl methacrylate monomer and polymer. White beads represent a co-monomer, compatible with methyl methacrylate, and some large pellets of vinyl acetate represent any impurity which does not attack the monomer molecule and does not enter into the polymer chains, such as an organic plasticizer. Holes were drilled in the sides of the beads since these beads were to be used to illustrate the phenomenon of cross linking.

Figure 1. Monomer molecules.

In Figure 1, the detached individual beads represent monomer molecules. If we disregard the side holes, it will be noted that each has a positive and negative end, a projection and an orifice which will receive and hold the projection of another bead. An infinite number of them can be joined in this manner to form a chain. A great many of these unconnected beads in a container would exhibit some of the characteristics of a liquid.

In Figure 2, sixty of the beads are joined together into a single chain representing a polymer molecule. The mobility of the group is no longer that of a liquid. The weight of our new unit, the chain, will be sixty times the weight of the individual bead. The molecular weight of the polymer is a multiple of that of the monomer. Average molecular





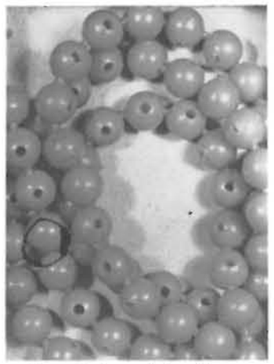

Figure 2. Long chain polymer.

weights of as high as 1,000,000 are specified in the basic materials from which some of the better denture bases are compounded.

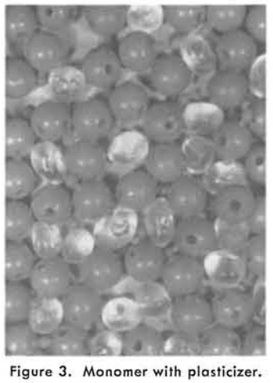

Figure 3. Monomer with plasticizer.

Figure 3 represents a methyl methacrylate monomer to which a quantity of plasticizer has been added. The plasticizer molecule does not possess the type of bond that will allow it to enter into polymers either with the methyl methacrylate or with itself. The large irregular clear beads representing plasticizer are scattered at random among the monomer molecules. It is dissolved in the mass of monomer, but the individual molecules are not in chemical nor physical combination with those of the monomer.

Short polymer chains and plasticizer molecules, monomer containing plasticizer or other inert matter when subjected to certain influences such as heat and catalysts will polmerize, and macromolecules will form until most of the monomers have either become parts of chains, or until chain growth is halted by encountering other growing chains or

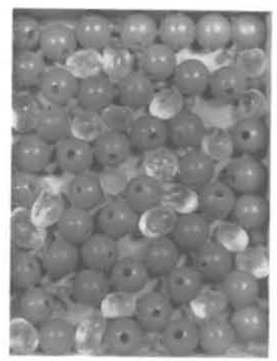

Figure 4. Plasticized polymer. Interrupted chains.

some inert obstructing molecules. Plasticizers are added to monomers in order to render the polymers softer, more easily moldable in compression or injection molding.

## Co-Polymers

Co-polymerization can result when two or more compatible monomers are mixed and the mixture is subjected to conditions necessary for polymerization. The subject of co-polymerization is a complex one, and beyond the scope of this discussion. Co-polymers are not mixtures of two or more preformed polymers, nor the result of the action of a monomer on a preformed polymer.

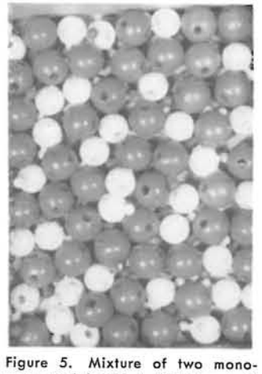

Figure 5. Mixture of two monomers: dark beads A, light beads B.

In Figure 5 we have mixed light colored beads and dark colored beads of differing sizes representing monomer A and monomer B. We will assume that each of these monomers is a methacrylate ester and hence related chemically, also we will assume that