

# the

# Record

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October 27, 1959

PUBLIC HEALTH SERVICE  
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## Science Teachers Visit NIH Labs

About 200 high school science teachers from the Washington area and nearby states attended an all-day science demonstration conference at NIH Saturday, October 17. The conference was co-sponsored by NCI and NIAMD, with the collaboration of the Office of Education and the National Science Teachers Association.

The teachers, who came from schools in the District of Columbia, Maryland, Virginia, and Delaware, observed a number of laboratory demonstrations specially designed by scientists of both Institutes. Some demonstrations in NIAMD laboratories were presented to an audience in the Clinical Center auditorium via closed-circuit television.

The day's program ended with a panel discussion of the demonstrations and scientific material presented. On the panel were Dr. John W. Renner, Deputy Executive Director, National Science Teachers Association; Dr. Zachariah Subarsky, Bronx High School, New York; and Dr. Ruth E. Cornell, Chairman, Secondary Science Department, Public Schools, Wilmington, Delaware.

An evaluation sheet completed by the visiting teachers indicated that 90 percent of the teachers rated the program excellent.



Science teachers attending the Science Demonstration Conference held recently at NIH were divided into small groups to visit laboratories. At left, Dr. Theodore T. Otani, Laboratory of Biochemistry, NCI, explains an improved method of paper chromatography suitable for use in high school science classes. At right, Dr. Koloman Laki, Laboratory of Physical Biology, NIAMD, demonstrates the conversion of fibrinogen to fibrin, the gelatinous substance which forms blood clots.

## Record Presents "New Look," More News, Science Section

With this issue the NIH RECORD appears in new size and garb, marking the first basic change in format since the Number One issue came off the press on May 20, 1949.

At that time the employee population of NIH was 2,200. During the intervening 10 years and six months, NIH programs have multiplied, in keeping with the Federal Government's growing support of medical research. The number of NIH employees has increased to 7,600.

This growth of program and personnel has made the RECORD's role of central news dispenser not only more essential but more difficult. The lack of sufficient space within its four small pages has limited news coverage and, except for the Science Series feature, has made the reporting of research impossible.

This handicap has been at least partially removed by a moderate expansion of page size, providing four columns in place of three; by a slight reduction in the size of body type, resulting from a change in the methods of typesetting and printing; and by the addition of a four-page Science Section devoted primarily to summaries of findings reported by NIH scientists.

This Science Section, consisting of pages 3-6, is prepared by the NIH Office of Research Information and the Information Offices of the several Institutes and Divi-

sions. It is being published as an addition to the RECORD on a trial basis, and may be omitted from certain issues.

To facilitate and improve the coverage of NIH news, the slim RECORD staff will be aided by a number of contributors in NIH Information Offices, who will provide information and copy. Their names are listed on page 2.

It is hoped that others who are a source of news, though not so listed, will continue to supply usable information.

The RECORD staff, and all who have had a hand in planning the new format and the Science Section, hope also that the RECORD's readers will be pleased with the results.

## Former NIH Scientist Shares Nobel Prize

Dr. Arthur Kornberg, Professor and Chairman of the Department of Biochemistry, Stanford University, was awarded the 1959 Nobel prize in medicine, October 15. He was formerly chief of the Enzyme and Metabolism Section of NIAMD. Dr. Kornberg shares the honor and the \$42,606 prize with Dr. Severo Ochoa, New York University College of Medicine.

Drs. Kornberg and Ochoa were cited for "discoveries of the mechanism in the biological synthesis of ribonucleic acids and deoxyribonucleic acids." The two men worked together for a year in 1946 at New York University, but since that time have pursued their research separately.

On October 13 Dr. Kornberg visited NIH to present the Ninth NIH Lecture, entitled "Biosynthesis of Deoxyribonucleic Acid (DNA)." At that time he recalled

## Dr. Himmelsbach Is Appointed CC Associate Director

Dr. Clifton K. Himmelsbach was appointed Associate Director of the Clinical Center, as announced by Dr. James A. Shannon on October 15. Before occupying this position, Dr. Himmelsbach was Director of Special Programs for DRG. He succeeds Dr. K. W.



Dr. Clifton K. Himmelsbach

Chapman, who died September 18.

Dr. Himmelsbach has been with PHS since 1931 and joined the NIH staff in 1957. His career with PHS includes service as Clinical Director and later as Director of Research at the USPHS Hospital in Lexington, Ky. He was a medical consultant in the Office of Vocational Rehabilitation at Kansas City, Mo., and Chicago. In Washington, he was Medical Officer in Charge, PHS Out-Patient Clinic, and Chief, Division of Hospitals, in the Bureau of Medical Services.

A graduate of the University of Virginia Medical School, Dr. Himmelsbach was selected for special graduate training in pharmacology at Western Reserve University after his internship in the USPHS Hospital in New Orleans. He later studied drug addiction at Fort Leavenworth, Kan., and Pondville, Mass.

some of his experiences at NIH and expressed his pleasure at seeing old friends.

(See story on NIH Lecture, page 3.)

# the Record

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Editor ..... Elizabeth D. Mok

### Staff Correspondents

Elaine Johnson, NCI; William Sanders, NHI; Kathryn Mains, NIAID; Lillie Bailey, NIAMD; John Kley, NIDR; Lucille Furman, NIMH; Arlene Martin, NINDB; Elsie Fahrenthold, CC; Arlene Butterly, DBS; Janet Gallagher, DGMS; Phyllis Snyder, DRG.

## 32 Employees Win Incentive Awards

An awards ceremony, highlighted by a film describing the incentive awards program, was held October 16 in Wilson Hall. Checks totaling \$3,655 were presented to 32 employees.

Joint chairmen of the program were Joseph S. Murtaugh, Office of Research Planning, OAM, and Richard L. Seggel, NIH Executive Officer. Mr. Murtaugh is chairman of the NIH Board on Employee Awards.

Mr. Seggel and Billy J. Sadesky, head of Budget Management, OAM, made individual presentations to the budget staff, which received a group award amounting to \$1,915. They were cited for their superior and dedicated performance, sense of personal responsibility, and technical competence.

The group included, from OAM: Richard L. Hopkins, Carl A. Jones, Martin J. Fuller, Wilford W. Finney, Frederick V. Shaw, Jr., Burk Walker, John G. Hoff, Robert B. Lauder, Jr., Donald F. Brown, Emma L. Akers, George M. Kingman, and Frances H. Pettinato. Also Mary F. Davis, John H.

Reeder, Elizabeth J. Hennigan, Charles N. Taylor, Ann M. Stahr, Louise B. Freeman, and Elizabeth J. Richards.

Others in the budget group were Hamilton P. Stillwell, NIMH; Anna Windsor, NINDB; and Elizabeth Wiehle and Ollie V. England of NHI.

In addition, a check for \$95 was presented to Jeanne Heffernan, NIAMD, widow of Milton Heffernan, who had been a budget examiner in NIAMD. Mr. Heffernan died in February 1959.

For the invention of plastic filter holder slides, which saved NIH over \$6,000 in the first year of operation, Philip R. Joram, DRS, and Pasco del Vecchio, NCI, shared a \$200 award.

A check for \$230 was divided among Nancy J. Hillman, Anita W. Gosier, and Ruth H. Manning, Grants and Training Branch, NHI, for the preparation of a manual on procedures.

Irene Skinner, Office Services Branch, OAM, received \$160 for superior performance in the development of a training course for

(See AWARDS, Page 7)

## UGF Drive Opens at NIH

At a UGF rally held in the CC auditorium on October 7, DHEW Secretary Arthur S. Flemming congratulated NIH employees on the good showing they had made during the first week of the campaign, and expressed confidence that they would reach their goal.

"We must demonstrate by our deeds," he said, "that we recognize our responsibility to help our fellow human beings to realize their highest potentials."

Dr. John R. Heller, NCI Director, who is PHS Chairman for the campaign, and Dr. John A. Porterfield, PHS Acting Surgeon General, urged NIH employees to make every effort to meet their fair-share quotas.

Dr. Jack Masur, CC Director and NIH chairman of the UGF drive, reported excellent progress during the first week of the campaign. He introduced the "Kilties," 2nd Army Pipe and Drum Corps, who entertained with bagpipe music.



DHEW Secretary Arthur S. Flemming greets two of the "Kilties" of the 2nd Army Pipe and Drum Corps as they prepare to entertain NIH employees at the recent UGF Rally.

## 83% of UGF Quota Gained by 3rd Week

A total of \$50,469 was contributed by NIH employees to the UGF drive by the end of the third week of the campaign. This represents 83 percent of the \$60,469 quota, and 73 percent participation.

Six major NIH components have exceeded their quotas: DGMS at 147%, DRG 114%, NIDR 113%, NIAID 110%, OD-NIH 103%, and NIMH 102%.

According to Dr. Jack Masur, NIH Campaign Chairman, "This is the first year we've come so close to meeting our quota at this stage of the campaign. My special congratulations go to the five groups who have already gone over 100 percent. I'm confident that NIH as a whole will meet or exceed its goal."

A breakdown of figures by Institutes and Divisions follows:

	% of quota	% of participation
DGMS	147	100
DRG	114	105
NIDR	113	100
NIAID	110	84
OD-NIH	103	91
NIMH	102	83
NHI	89	74
OAM	86	85
NINDB	84	77
CC	82	63
NIAMD	77	75
DBS	76	55
NCI	66	69
DRS	54	57
Averages	83	73

## PELMOTER APPOINTED



Albert L. Pelmoter has been appointed Employee Development Officer, Personnel Management Branch, OAM. He assumed his duties on October 19.

Mr. Pelmoter will plan and conduct employee and supervisory in-service training programs, and serve as advisor to operating activities in the development of training programs and in the use and availability of training facilities and resources.

Mr. Pelmoter was with the Training Branch, Division of Personnel, PHS, since August 1955. Prior to that he was an educational specialist at the Engineer School, Fort Belvoir, Va., and the Aberdeen Proving Ground, Md. He has served as an instructor in mathematics with the Woodward School, Washington, D. C.; the University of Kentucky; and Catholic University.



Members of the staff of Budget Management Section, Financial Management Branch, OAM, are pictured after they received a group award for superior performance. On the extreme right is Richard L. Seggel, NIH Executive Officer, who presented the awards.

# Science Section

This four-page section is devoted chiefly to summaries of research findings that have been reported by scientists of the National Institutes of Health. This section is prepared by the Office of Research Information, NIH, and the Information Offices of the Institutes and Divisions.

## ARTHUR KORNBERG DESCRIBES BIOSYNTHESIS OF DNA

### NIH Hears New Data on Sequence Of Links in Synthesized DNA Chain

In the ninth NIH Lecture, October 13, Dr. Arthur Kornberg described the biosynthesis of deoxyribonucleic acid (DNA), the nuclear substance believed to convey genetic information in the reproduction of all cells.

Dr. Kornberg and colleagues at Stanford University, and formerly at Washington University School of Medicine, have linked DNA building blocks—simple nucleotides—into a chain of high molecular weight. This has the same physical and chemical properties as the DNA of animals, bacteria, plants and viruses.

The complex linkage is effected by an enzyme extracted from hun-

dreds of pounds of *Escherichia coli*.

Still another factor must be present for the chain to form—a primer. This is a small quantity of DNA of the type to be made. In Dr. Kornberg's studies, primers were derived from *E. coli*, *A. aerogenes*, calf thymus, T2 phage, and an AT product.

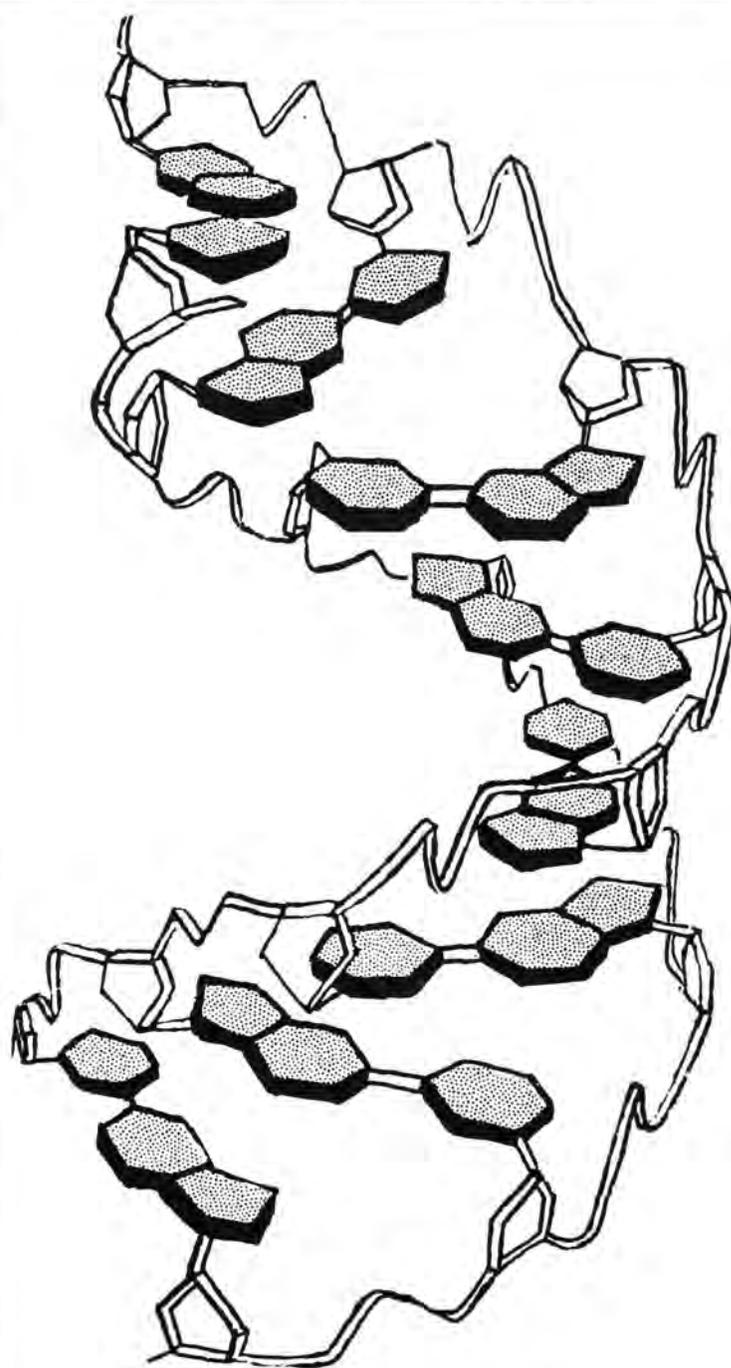
The synthesis *in vitro*, Dr. Kornberg pointed out, corresponds with the presumed behavior of DNA in nature. Building blocks, enzyme, and primer could all be present in the living cell, and could account for its genetic endowment. In other words, the DNA of the genes, like the experimental primer, could serve as a template for the enzymatic replication of DNA in each cellular generation. The studies are concerned with DNA's replicating function rather than its broader role of coding the synthesis of other cell components and products.

Four of Dr. Kornberg's slides are reproduced here. The first represents a segment of the DNA molecule. The darker units are bases linked by nitrogen bonds and attached to outer chains of sugar (white pentagons) and phosphate (kinks). The over-all structure can be visualized as a spiral staircase.

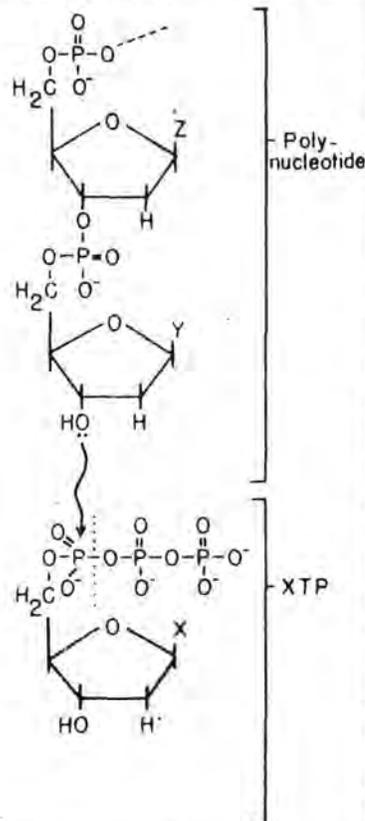
#### Idea Derived from Work at NIH

In early studies at the National Institutes of Health, Dr. Kornberg discovered a series of reactions that effect the biosynthesis of important coenzymes, DPN and FAD. In this reversible process, inorganic pyrophosphate is formed and the enzymes are known as pyrophosphorylases. This has since been found to occur in the synthesis of other substances including some proteins and fats. In attacking the present problem, Dr. Kornberg reasoned that nucleic acid too would be made in the cell by a reversible pyrophosphorolytic mechanism.

His results bear out this assumption. He and his group have demonstrated that a highly polymerized DNA can be synthesized enzymatically from appropriate starting materials. It resembles



1. Hypothetical helical structure of DNA.



2. Postulated mechanism for extending a DNA chain.

natural DNA in many properties—molecular size, vulnerability to heat, viscosity, etc. Figure 2 illustrates a typical reaction by which a nucleotide (XTP) is added to the chain.

#### Product and Primer Alike

It is very striking that the bases (X, Y and Z in the figure) are present in the same proportions as they are in the primer. The proportion of the bases in the starting material does not affect the composition of the product.

Dr. Kornberg reported new data indicating that the bases in the synthesized DNA, as compared with those of the primer, are also in the same sequence.

#### Supports Watson-Crick Hypothesis

The bases, indicated in figure 3 by letters in squares, are adenine and guanine (purines), thymine and cytosine (pyrimidines). Each base is attached to a backbone of deoxyribose (sugar) molecules linked by phosphate groups. Base, sugar and phosphate together form a nucleotide.

Such a chain, or polymer, about a thousand times longer than thick, has been postulated by Watson and Crick to exist in nature paired with a corresponding chain. The paired chains seem to be wound around a common axis to form a helix. Each base of one chain is connected

(See KORNBERG, Page 6)

## Adjuvant Opens Vistas in Immunology

Summary of research for which Dr. Jules Freund, National Institute of Allergy and Infectious Diseases, received the Lasker Award, and comment by Dr. Joseph E. Smadel, Associate Director of Intramural Research, National Institutes of Health.

The discovery of water-in-oil adjuvant technique, like so many fundamental discoveries in science, arose as an accident. In an experiment to test the effect of injecting a mixture of paraffin oil and tubercle bacilli on sensitization to tubercle bacilli, it was found that the guinea pigs so injected became very highly sensitized and the sensitization lasted as long as the animals were tested. At the end of a year the experiment was discontinued, the animals were discarded, and their sera were used as a source of complement in a tuberculin complement fixation test.

The test was a failure because the serum contained a very high titer of complement-fixing antibodies against the tubercle bacilli. This suggested that mixing the tubercle bacilli and paraffin oil not only led to an increase in the tuberculin hypersensitivity of the animals, but also an increase in the titer of circulating antibodies.

Subsequently it was proved that the injection of a mixture of tubercle bacilli in oil did in fact give rise to a much higher titer of circulating antibodies than the injection of tubercle bacilli alone. This discovery in turn led to the idea that the adjuvant effect of oil might be a general one. On emulsifying saline suspensions or solutions of various antigens—such as typhoid bacilli, horse serum, malaria parasites, or polio virus—in oil and injecting these into experimental animals, Dr. Freund found that a much increased antibody formation took place.

Stimulated on the one hand by the old reports that tuberculous animals gave higher antibody response than nontuberculous animals and by the report of Dienes that injection of antigen into a tuberculous focus in animals gave rise to a delayed hypersensitivity, Doctor Freund added killed tubercle bacilli to the water-in-oil emulsion of the antigen.

As hoped, the water-in-oil emulsions of antigen containing tubercle bacilli markedly increased the antibody titer over water-in-oil emulsions of antigen alone. In addition, a delayed hypersensitivity to the injected antigen was also found.

This technique whereby dead tubercle bacilli could be substituted for the infection by living organisms made possible the subsequent manifold applications of the water-in-oil technique to problems in immunology.

### Water-in-Oil Adjuvant

One can only touch on the manifold applications of this water-in-oil adjuvant technique in immunology, experimental pathology, and its beginning applications in human medicine.

The increase in antibody response found with water-in-oil emulsions, the so-called "incomplete adjuvant," or the even greater response obtained with water-in-oil emulsions plus dead tubercle bacilli, the so-called "complete adjuvant," manifested itself as an increase in peak titer and an increase in duration of the antibody response, and a decrease in the amount of antigen required to give a maximum response or in the number of injections required.

The advantages over other methods of immunization are so great that many if not the majority of investigators in immunology use "Freund's adjuvant" as the preferred method of immunization. The use of water-in-oil emulsions enabled the investigations of the antigens occurring in animal and human tumors to be assessed in their proper light. The use of this technique made it possible to demonstrate antigens in material in which mixtures of antigen occur. Without using this method, the very important minor antigens escaped discovery.

### Incomplete Adjuvants

A tentative start has been made in the use of incomplete adjuvant in immunization of humans by Dr. Jonas Salk, using killed polio virus and influenza virus. It is clear from the relatively little that has been done that the same advantages seen in the production of antibodies in experimental animals by adjuvants hold for humans.

If investigations in progress and those being planned demonstrate the innocuousness of such emulsions to humans, there is no doubt that the water-in-oil vaccines will play as great a role in vaccination against human disease as they now play in the experimental field. This may be particularly true in tropical countries and with certain diseases such as cholera. The duration of immunity in this disease is very short.

One of the most interesting and useful by-products of these studies has been the finding that the injection of extracts of certain organs, such as brain, thyroid, testes, etc., mixed with the complete adju-

vant give rise to diseases in the experimental animal which simulate certain human diseases.

The interest of this finding was further heightened when it was shown that the extracts could be made not only from an organ obtained from an animal of the same species as the one injected, but even from the very same animal. This meant that the old and very well established dictum that an animal could not become sensitized to its own substance had to be at least seriously modified if not indeed discarded. These findings also support the concept that certain diseases are due to "auto-immunization" or "auto-sensitization," i.e., to immunization of an individual by his own substance.

### "Auto-Immunization" Study

Possibly even more importantly it meant that a tool was at hand whereby these diseases could be studied in the laboratory. One short example will suffice.

It was shown that the injection of thyroid extracts emulsified in the complete adjuvant gave rise to thyroiditis in the experimental animal injected. The pathological picture seen in the thyroids of these animals very closely mimicked the pathological picture seen in chronic thyroiditis of humans. This finding inspired the discovery that circulating antibodies against human thyroid are found in patients with this disease.

Various other examples of the application of this concept to human disease have also been adduced. It is perhaps not too hazardous to prophesy that additional fundamental or applied applications of the use of Freund's adjuvant will present themselves.

### Comment by Dr. Smadel:

"I wish to go beyond the immediate details of the Freund adjuvant technique and talk of some of the dreams of the immunologists and public health officers which are approaching attainment because of the developments of the Freund concept.

"There was a well-recognized need for means of increasing the intensity and duration of the immunity elicited by current vaccines against the infectious agents and toxic substances. Furthermore, in recent times a host of viral diseases, some old but mostly newly recognized, have been shown to be controllable by proper immunization procedures.

"One of the principal problems that now faces the physician, the immunologist, and the public health officer is the plethora of vaccines and the numerous 'shots.'

"The dreams of a few years ago are nearer attainment because of Freund's work with adjuvant substances that are capable of in-

## Metastases Contain Fewer Diploid Nuclei

Repeated observations have shown that the characteristic diploid number of chromosomes of experimental tumors may change after many transplant generations. This change is always toward a higher value of ploidy, an increase in chromosomal number.

In an attempt to obtain information about changes in ploidy in human cancer, Dr. Giancarlo Rabotti, a Visiting Scientist in the National Cancer Institute's Laboratory of Pathology, compared the chromosomal composition of cells in human primary tumors with that of their metastases. The amount of deoxyribonucleic acid (DNA) per nucleus, which provides information on the chromosome count, was determined by a microspectrophotometric technique.

The results reported in a recent issue of *Nature* showed that in all instances the diploid (2DNA) chromosomal arrangement characteristic of normal cells was evident in the control lymphocytes and primary tumor cell nuclei.

In addition, some degree of hetero-poly ploidy (4 DNA and 8 DNA) was found in the primary tumor. On the other hand, the metastatic lesions contained fewer diploid nuclei and higher proportions of abnormal or hetero-poly ploidy forms.

The author concludes that there may be two explanations for the differences in chromosome ploidy between primary tumors and metastases: While all types of cells may be discharged from the primary tumor into the blood or lymph, only the heteroploid cells may be able to establish metastatic foci. Or, only heteroploid cells may leave the tumor to establish secondary growths.

creasing the immunological response that can be attained with a given quantity of antigen. He has done for immunology what the atomic scientist did for the military, which has been paraphrased as 'a bigger bang for a buck.'

"It may well be that a decade or two from now we will no longer use any of the present constituents of Freund's adjuvant mixture. On the other hand, I am confident that we will progress in the development of our ideas which first were given substance by Freund's work and his adjuvant mixture. Indeed, the whole concept of the use of multiple antigen vaccines, of a basic course of immunization to make the individual capable of responding effectively and rapidly to a booster dose of antigen, has come closer to practical application."

# Wire Strain Gauge Records Effect of Drugs on Heart Contractile Force

The first measurements in man of the direct effects on the contractile force of the heart muscle of digitalis, adrenalin, and the recently adopted "anoxic" method of temporarily stopping the heart-beat have been made in the National Heart Institute's Clinic of Surgery by the application to the human heart of the resistance wire strain gauge arch.

The measurements, which have already prompted some potentially lifesaving new guidelines for the preparation of heart surgery candidates, were reported by Drs. Robert D. Bloodwell, Leon I. Goldberg, Eugene Braunwald, Joseph W. Gilbert, John Ross, Jr., and Andrew G. Morrow at the recent meeting of the American College of Surgeons.

The Walton-Brodie strain gauge arch used in these studies resembles industrial strain gauges in that it is basically an element of "resistance" wire, which responds to stretching tensions with variations in its resistance to electrical current.

In the Walton-Brodie instrument, the tiny coiled thread of resistance wire is housed in an inch-long metal cylinder to insulate it against body fluids. By harmlessly anchoring the two ends of the device to the myocardial fibers, the muscle contractions are made to stretch the resistance wire. With the passage of a weak electrical current through the wire, the heart muscle's contractile force is thus translated into an electrical expression, which can be made to deflect the line traced by a recording device.

Applied earlier by engineers to the measurement of mechanical quantities in industry, such as acceleration, pressure, and impact force, the device was recently adapted to the heart by R. P. Walton, O. J. Brodie, and others at the Medical College of South Carolina. These workers, and another team headed by T. D. Darby from the same institution who later gave it its first application in humans, were supported in their studies by Heart Institute research grants.

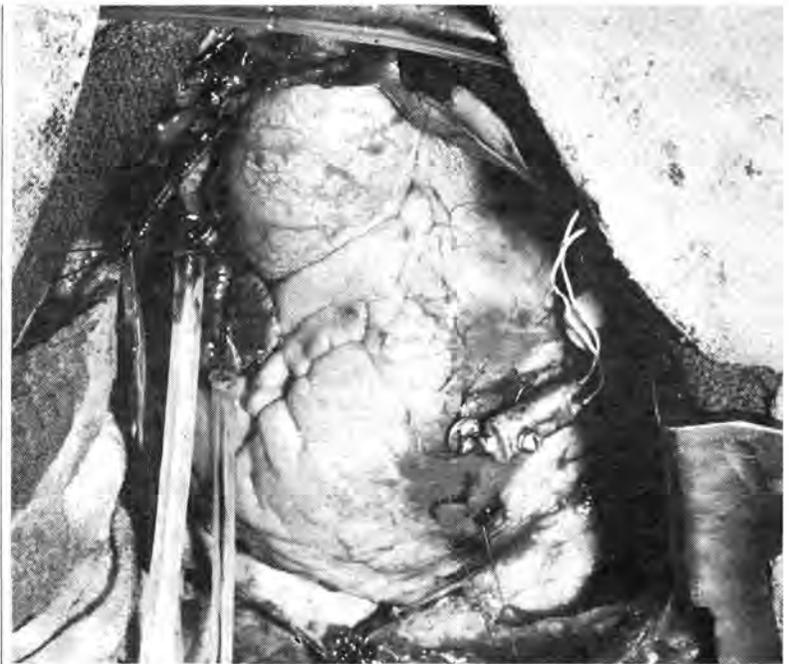
Applying the Walton-Brodie strain gauge arch in 47 patients undergoing heart surgery, the NHI team has learned that digitalis compounds greatly increase the contractile force of the non-failing, as well as the failing heart muscle. The widely held view that the tonic effect of digitalis on the heart muscle is limited to patients with congestive heart failure has inhibited preoperative use of this valuable drug in heart sur-

gery candidates who might have derived some protection from it.

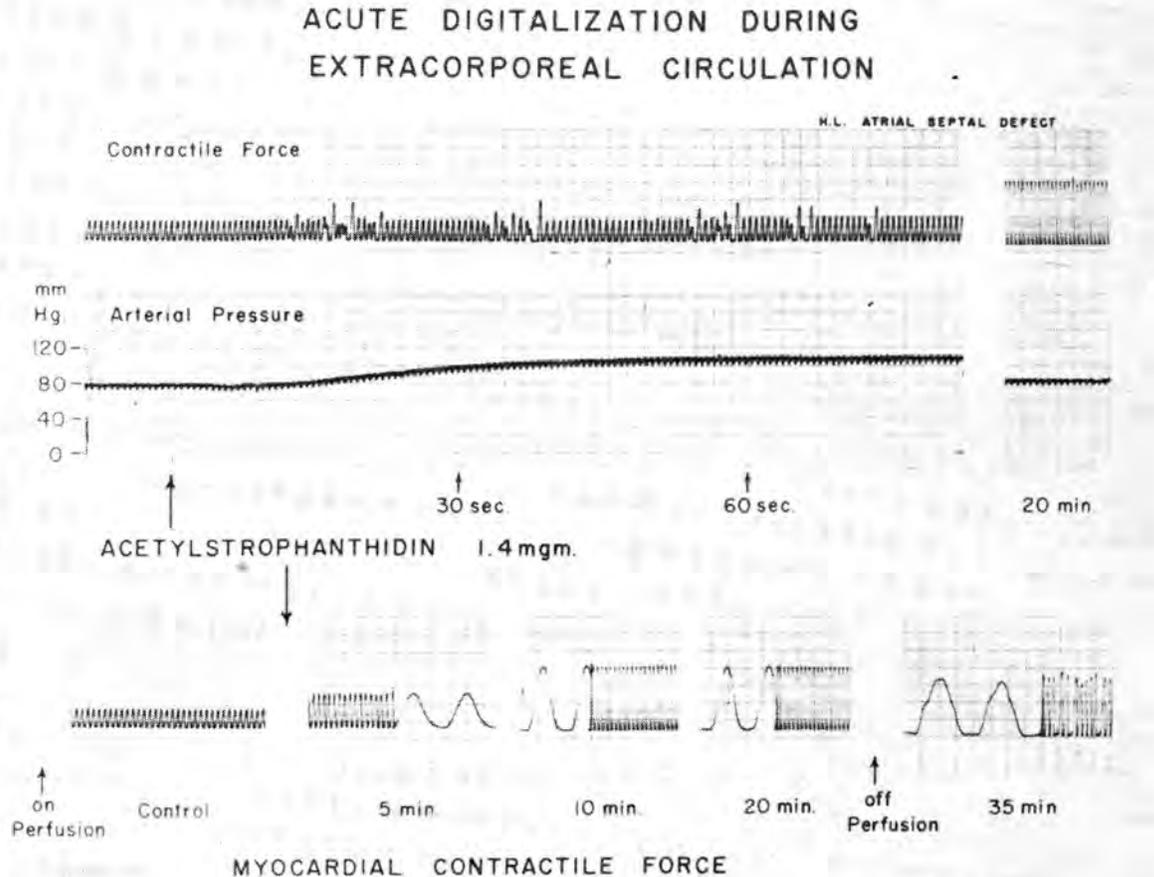
In other drug studies, it was found that the clinically important "adrenalin" compounds, epinephrine and norepinephrine, had comparable effects in increasing the contractile heart's force.

The recently adopted "anoxic" method of elective cardiac arrest, by which the heart is temporarily stopped by intermittently clamping off its entire outflow through the aorta, was evaluated in twelve of the patients at open heart operation. Although the measured contractile force of their heart muscle disappeared quickly on clamping the aorta, it also returned quickly to control levels after the clamps were removed and blood once again moved through the coronaries.

The prolonged myocardial depression that has been reported to occur following drug-induced elective cardiac arrest did not occur with the anoxic method.



This photograph was taken at surgery during correction of congenital pulmonary stenosis in a 28 year old woman. The strain gauge arch is sutured to a convenient location on the surface of the right ventricular myocardium for recordings of cardiac muscle force during the procedure. (Response of the heart to the operative valvular correction, to the extracorporeal artificial circulation, and to any injected drugs or anesthetic agents can be evaluated.)



This chart contains sections of the recordings of heart muscle contractile force and mean arterial pressure during open heart repair of an atrial septal defect in a 27 year old patient. This is a representative record of the first human documentation of the increased force of heart muscle contraction caused by digitalis in the ab-

sence of heart failure. A rapidly acting digitalis preparation, acetylstrophanthidin, was injected at the site of the arrow and resulted in an early transient rise in arterial pressure and a gradual, but sustained, increase in heart contractile force. Increase in amplitude of the tracings reflects increasing force of contractions.

## Card Sorting Test Shows Aging Changes

A comparison of abilities of younger and older subjects to learn and perform a graded series of card-sorting tasks revealed that the older group did relatively less well on the task requiring the most mental manipulation and perceptual searching.

The investigators, Dr. Jack Botwinick, Joseph S. Robbin, and Joseph F. Brinley of National Institute of Mental Health's Laboratory of Psychology, found that as the task became more difficult, both age groups slowed in their performances up to a critical point in complexity of operations required.

The rate of improvement with practice within each difficulty level was the same for both age groups.

The study was reported at the recent meeting of the American Psychological Association, and the paper is in press.

## Tartar Linked with Enzyme Activity

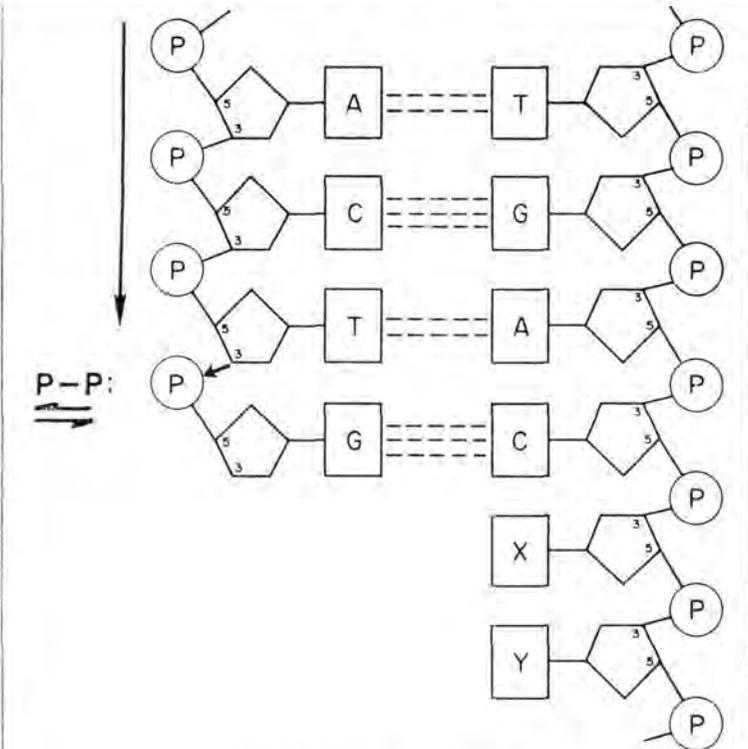
The manifold nature and great variety of factors associated with periodontal disease presents an elusive dental research problem today. While laboratory and clinical studies have identified calcified deposits on teeth as a pathologic factor contributing to periodontal disease, many questions concerning the mechanism of calculus formation remain unanswered.

National Institute of Dental Research scientists now report on the use of enzyme histochemistry as a tool for the study of early calculus deposits.

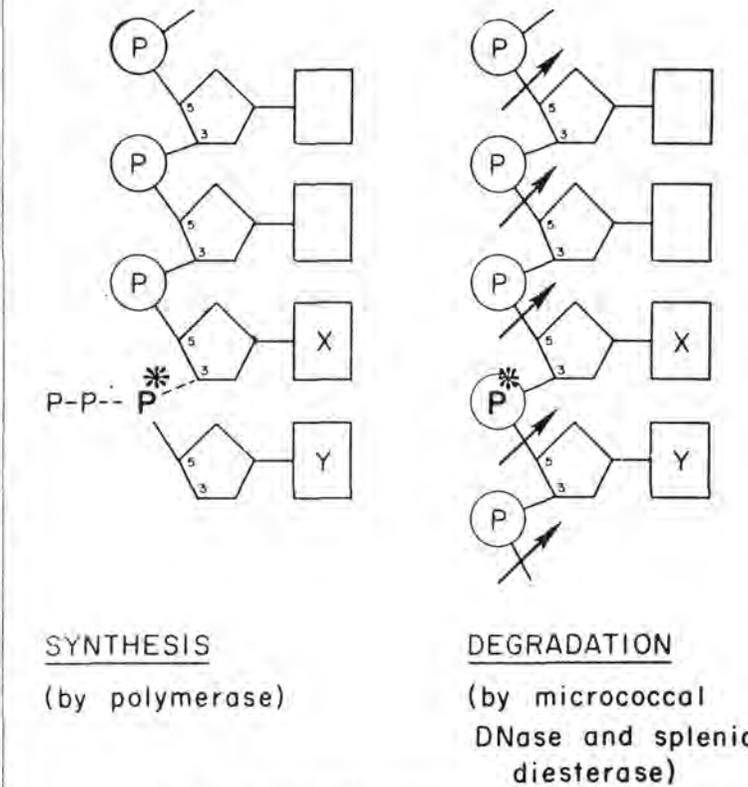
In combined clinical and laboratory studies carried out by Dr. Paul N. Baer, Clinical Investigations Branch, and Dr. M. S. Burstone, Laboratory of Histology and Pathology, it was shown that soft deposits, identified as early calculus, could be formed on Mylar strips placed in the mouths of periodontal patients.

Histologic examination of strips incubated in substrate solutions to show presence of esterase activity revealed the bulk of the deposits to be clumps of coccoid and filamentous forms of bacteria.

Esterase activity was discernible as an intense red stain in both microorganisms, with cocci showing highest activity. Diminishing esterase activity of leukocytes, macrophages, and epithelial cells was also evidence and appeared to



3. Mechanism for DNA replication.



4. Procedure for determining sequences in DNA.

be correlated with cell vitality.

One recognized concept of calcification holds that fatty acid esters represent a determining factor in pathologic calcifications by means of a saponification mechanism. In this regard, it is noted that hydrolysis of fatty acid esters by enzyme (esterase) activity may release fatty acids which are presumably capable of

forming calcium and magnesium soaps. These soaps, which have the appearance and consistency of early deposit formations, may then undergo transformation into the less soluble phosphate and carbonate, both recognized as constituents of oral calculus.

The study was reported in the *Journal of Oral Surgery, Oral Medicine and Oral Pathology*.

## KORNBERG

(Continued from Page 3)

with a base of the other, purines paired with pyrimidines. The order of the bases along the sugar-phosphate backbones presumably determines the genetic code.

It is believed that the paired DNA chains separate in cell division, and that each strand, even while the separation occurs, primes the synthesis of a corresponding strand. The configuration of the bases is such that each can be paired with only one of the four types, and thus the enzyme can only link the preformed nucleotides in a certain order. Dr. Kornberg's preliminary evidence that the bases in his DNA chain are in the same sequence as those of the primer lends support to this theory.

### Determining Sequence of Links

Figure 4 outlines the method Dr. Kornberg used for determining the sequence of the bases. It involves (1) synthesis of DNA incorporating radioactive phosphorus,\* (2) degradation into deoxynucleotides, (3) separation of those by paper electrophoresis, and (4) observations on the labeled units. Dr. Kornberg attributed certain steps in the method to Dr. Leon A. Heppel, National Institute of Arthritis and Metabolic Diseases.

### Pattern for Synthesis in Nature

His own experience and the work of others have led Dr. Kornberg to offer a generalization in biology—the hypothesis that synthetic reactions in general proceed by pyrophosphorolysis, the elimination of pyrophosphate. He relegated to a degrading role the phosphorylases, which reversibly eliminate orthophosphate. The synthetic drive is supplied by the ubiquitous enzyme pyrophosphorylase, which splits pyrophosphate irreversibly and thus eliminates one of the products of the pyrophosphorylytic reaction.

### New Genes for Old

Because of impurities in the key enzyme, it has not been possible to synthesize a DNA molecule without some fragmentation. Thus the product cannot yet be successfully tested for biological properties. Such a test might consist in altering the genes of a microorganism—converting, say, one type of pneumococcus into another.

This, of course, is a long-range implication of Dr. Kornberg's work. It suggests the possibility of correcting defective genes in man.

In future studies, Dr. Kornberg and his colleagues will try to purify the enzyme. They hope eventually to "break the most important code in biology."

\*P<sup>32</sup>-labeled phosphate, from which pyrophosphate has been eliminated.

## WHERE IS IT?



The seal of the U. S. Public Health Service, pictured here, appears on the face of the CC beside the main entrance. The device denotes the oldest function of the Service, the operation of Marine Hospitals for the care and treatment of merchant seamen. The winged wand with two serpents entwined, symbolizing the medical profession, is the caduceus of Mercury—a Latin god identified with commerce—used here to illustrate the relationship of the PHS with merchant seamen and the maritime industry. The anchor, representing the merchant marine, is fouled with a chain to signify a seaman in distress. This corps device was designed by Surgeon General John M. Woodworth in 1871.

## Congress Enacts Law To Amend Provisions Of Life Insurance Act

Several important changes in the Federal Employees Insurance Act were made by Public Law 86-377, enacted September 23. The changes affect all insured employees except those who died or retired before September 23.

Full coverage is in effect at all times during employment, regardless of the age of the employee. Formerly, insurance was reduced after the employee reached 65.

Employees 65 years and older will pay full insurance rates beginning the first pay period after September 23.

Life insurance is continued without cost after retirement for disability or after at least 12 years of creditable service of which at least 5 years are civilian service. Each month, beginning the first day of the second calendar month after the date of retirement or the employee's 65th birthday, whichever is later, life insurance is reduced by 2 per cent of the amount in force before the first reduction. The insurance cannot be reduced more than 25 percent of the original amount.

## AWARDS

(Continued from Page 2)

new clerical and stenographic employees.

A superior performance award of \$200 was given to Alice M. Laskey, program analyst in the Extramural Programs Branch, NIAID.

The piano team of George W. Cornwall, NIAID, and his wife, Irene, provided intermission and background music during the ceremony.

Checks were presented recently in Institute and Division ceremonies. Joseph Agar, Laboratory of Chemistry, NIAMD, received \$100 for a more efficient synthesis of phenazocine. For sustained superior work performance, Adele Van Devanter, Office of the Chief, DRS, and Margaret Walker, Office of the Director, CC, each received \$155.

Marjorie Romine, Henry Lutterlough, James M. Miles, and Tresvant Goodwin, of the Laboratory of Nutrition and Endocrinology, NIAMD, received the sum of \$390 for their team effort on the isolation of a new vitamin form of folic acid.

Janice Matsutsuyu, until recently with the Psychiatric Nursing Service, NIMH, received a sustained superior performance award of \$150.

## South Africa Joins Fellowship Program

The Union of South Africa has become the 31st country to participate in the NIH International Fellowship program.

The South African Council for Scientific and Industrial Research will serve as the parent organization for a research fellowships nominating committee that will examine qualifications of candidates for the Fellowships, and make recommendations to the NIH Fellowship Panel which selects the awardees. Chairman of the nominating committee is Professor S. F. Oosthuizen, president of the South African Medical and Dental Council.

Nominees for the Fellowships will be drawn from all four provinces of the Union: Natal, the Transvaal, Orange Free State, and Cape Province. The Union of South Africa is expected to submit its first list of candidates for NIH consideration by January 1960. DRG administers this program which provides postdoctoral research training in a U. S. institution of the Fellow's own choosing.

## COA to Hold Fall Dance

The Commissioned Officers Association, PHS, will hold a Halloween Dance Saturday, October 31, from 10 p. m. to 1 a. m. in Wilson Hall. Dick Shelton's orchestra will provide the music.

Tickets are \$3.50 per couple. Reservations may be made with Dr. Arthur E. Rikli, Oliver 2-6126; Dr. Wilton M. Fisher, Oliver 4-3214; or Donald L. Snow, ext. 3261.

## Dr. Freund Receives Albert Lasker Award



Dr. Jules Freund, Chief of the Laboratory of Immunology, NIAID, received one of the seven Albert Lasker Awards for Extraordinary Public Service to the Nation's health on October 22. Presented to him at the meeting of the American Public Health Association in Atlantic City, the honor includes a gold Winged Victory of Samothrace statuette, symbol of victory over death and disease; an illuminated citation; and an honorarium of \$2,500.

Three other scientists so honored are Dr. J. H. Dingle, Western Reserve University Medical School; Dr. Albert H. Coons, Harvard University Medical School; and Dr. Gilbert Dalldorf, of the National Foundation. A similar award was made to Maurice Pate, Executive Director of the United Nations Children's Fund.

(See story on Dr. Freund's research, page 4.)



LIFE AT NIH is shaping up, to judge by these rehearsal pictures. At the left, Mary Sandford, Verece G. Silverman, and Caroline Grohman listen admiringly as Leonard A. Stitelman tells about the fascinating responsibilities of his new job as "traffic director." At right, Roy Perry, as a psychiatrist, gives non-directive therapy to Bobbi DuBois in a skit entitled "Patient vs. Impatient." The show, with a cast of 50, opens at the CC Auditorium November 12 for a 3-day stay.



The second annual NIH Art Exhibit (left), sponsored by the Recreation and Welfare Association, will continue through November 6 in the lobby of the Clinical Center. Judges picked 75 items for display out of 130 submitted, and awarded cash prizes to winners in each of three divisions. Prize-winners



in the NIH Art Exhibit (right) display their entries. From left to right Stanley Jacobson, NIMH, with his oil painting "Yellow Fruit"; Winnie Erikson, DRS, with "Sunflowers"; Sadie Fishman, NIMH, with her sculptured "Introspection"; and Dr. Frank T. Perkins, DBS, with his bowl and spoons.

## Prizes Awarded At Art Exhibit

The second annual NIH Art Exhibit, sponsored by R&W, is on display in the lobby of the Clinical Center until November 6. Cash prizes were awarded to three winners in each of three divisions—oil painting; water color and print; and sculpture, ceramics, and silver.

Judges of the entries were James McLaughlin, curator of Phillips Gallery, Don Turano, well-known sculptor and teacher of sculpture, and Prentiss Taylor, prominent artist and print-maker. They evaluated 130 items before choosing 75 for display.

Stanley Jacobson, Clinical Investigations, NIMH, was given the first prize of \$50 in the oil painting division. Michael S. Murtaugh, son of Joseph S. Murtaugh of the Office of the Director, won first prize, \$50, in the water color and print division.

In the third division, two first prizes of \$30 each were awarded. Winners were Sadie Fishman, Clinical Investigations, NIMH, and Dr. Frank T. Perkins, a visiting scientist from London who presently is working in DBS.

Second prize, \$25, in the oil painting division was awarded to Winnie Erikson, Medical Arts Section, DBS. Third prize, \$10, went to Jennie Knight of the Research Branch, NIMH.

In the water color and print division, Dr. Joel J. Elkes, St. Elizabeth's Hospital, won second prize, \$25, and Catherine Andrews, daughter of Dr. J. Robert Andrews, NCI, won third prize.

Second prize, \$15, in the last division was awarded to a second entry by Jennie Knight. Beverly Peterkofsky, NHI, won third prize.

## Murray Aborn Heads New Study Section

A new study section, Behavioral Sciences, has been established within DRG. The section previously holding this designation has been renamed Experimental Psychology.

Dr. Murray Aborn has been reassigned to head the new section, and has been succeeded as Executive Secretary to the Mental Health Study Section by Dr. Clark J. Bailey. Dr. Bailey recently transferred from NINDB to DRG.

Dr. Aborn's new section, the 34th study section within DRG, will function within the framework of Dr. Murray Goldstein's Health Services Research Group. It will review all research grant applications relating to studies of social, cultural, and psychological aspects of social problems; social and interpersonal perceptions; sociological and anthropological theory; language and verbal behavior; and others. The section will deal with subject matter closely related to both the Mental Health and the Experimental Psychology study sections.

## Medical Service Fees Rise

Employees of NIH who subscribe to Medical Service of the District of Columbia, Washington's Blue Shield Plan, will pay increased rates starting November 10. Persons holding individual surgical service contracts will pay \$1.14 a month (a 14-cent increase); holders of the family surgical service contract will pay \$4.36 (a \$1.16 increase). Persons with individual surgical-medical

## PEB Reorganization Clarifies Functions

Reynold R. Holliday, Chief of the Plant Engineering Branch, DRS, recently announced the details of the reorganization of his Branch. The new system, which took effect October 7, combines like functions and eliminates overlapping.

Personnel and functions of the Project Control Office, Administrative Services Section, Construction Engineering Section, Electrical Engineering Section, and Mechanical Engineering Section were transferred to the Office of the Branch Chief and three newly-created sections.

Trent O. McPherson, from the Department of the Navy, heads the new Planning and Control Section; Russell N. Kulp, former Chief of the Mechanical Engineering Section, is Chief of the new Maintenance Engineering Section. Monette Ross, formerly a construction inspector, heads the new Shops Section.

The Engineering Design Section, under Lawrence F. Gaffney, former Assistant Chief of the Mechanical Engineering Section, was established during the present reorganization and has been in operation for several months. The Grounds Maintenance and Landscape Section remains unchanged.

contracts will pay \$2.20 a month (a 64-cent increase); holders of the family surgical-medical contract will pay \$6.46 (a \$1.52 increase).

Without the increase, claims and operating expenses next year would exceed subscription income by \$2,000,000.

## NINDB, NIDR Win Exhibit Awards

Two NIH exhibits won awards at medical meetings last month. Dr. Bruce E. Cohan, Ophthalmology Branch, NINDB, was awarded a bronze medal for an exhibit based on his work in experimental intraocular venography at the 60th Annual Meeting of the American Roentgen Ray Society in Cincinnati, September 22 to 25.

NIDR received one of three Awards of Honor given to Federal entries at the Centennial Meeting of the American Dental Association in New York, September 14 to 18. The exhibit depicted a series of studies headed by Dr. E. J. Driscoll, Clinical Investigations Branch, designed to gather base-line physiological data relative to the use of general anesthetics in oral surgical procedures.

Both exhibits were designed and constructed by Medical Arts Section, DRS.

## OBITUARIES

Joe M. Henery, 51, died October 7 in Walter Reed Hospital. Mr. Henery had been a laborer in the Transportation Section of the Office Services Branch, OAM, since May 1959. Previously, he served with the United States Army for 25 years.

Robert B. Buggs, 49, was a cook with the Nutrition Department of the Clinical Center from July 1955 until his death October 10. He was a native of Eldorado, Ark. His wife, Mildred, survives him.