

Credit Union Reports Changes in FCU Act, 4 1/4% Dividend

Officers of the NIH Federal Credit Union, reporting at the Credit Union's annual meeting January 13, disclosed changes in the Federal Credit Union Act and announced a dividend of 4 1/4 percent.

One revision in the Federal Credit Union Act specifies that the amount of a unsecured loan (not requiring co-signers or a share balance equal to the loan) be raised from \$400 to a permissible maximum of \$750. Other amendments state that the Board of Directors rather than a membership vote will declare the dividend figures and will appoint the supervisory committee.

Members Exceed 5,000

In the annual report it was noted that the NIH Credit Union's assets are in excess of a million and a quarter dollars, and that the total membership exceeds 5,000.

There has been a two-member increase in the Board of Directors, and an expansion of facilities is anticipated.

Members elected a Board of Directors
(See CREDIT UNION, Page 2)

Aging Conferences Launched; AAAS Conducts Symposium

An interdisciplinary symposium on aging, supported by a research grant from the Division of General Medical Sciences, was held December 29 and 30 at the annual meeting of the American Association for the Advancement of Science, in Chicago.

Dr. Nathan W. Shock, Chief of the Gerontology Branch, NHI, was instrumental in developing and conducting the symposium.

Various Aspects Discussed

The symposium brought together, before a new audience, eminent scientists from several disciplines to discuss various aspects of aging, ranging from the role of the endocrines to the effects of work and retirement.

Dr. James E. Birren, Chief of the Section on Aging, NIMH, and Drs. Shock and Bernard L. Strehler of the Gerontology Branch, NHI, were among the 17 speakers.

Also speaking were Drs. Ewald Busse and Philip Handler, key participants in the Duke University interdisciplinary Center for the Study of Aging, and Dr. Abraham White, a key participant in
(See SYMPOSIUM, Page 7)

A Maryland regional conference on problems of the aging, initiating the Maryland phase of similar county, regional, and state conferences to be held nation-wide this year, was conducted at the Clinical Center on January 20.

The many conferences planned throughout the country will prepare the way and lead up to the White House Conference on Aging in January, 1961.

The regional conference here was sponsored by the Maryland State Coordinating Commission on Problems of the Aging, of which Margaret C. Schweinhaut, Montgomery County delegate to the Maryland General Assembly, is chairman.

713 Attend

Five workshop sessions were attended by 713 people from civic, social, and welfare groups of Montgomery and Prince Georges Counties, who participated in a day-long study of many of the more pressing problems associated with old age.

One of the broad goals of the conference is to encourage additional research in aging. Four Maryland regional conferences, including the one held here, will be
(See CONFERENCES, Page 7)

Dr. Eagle Selected As First of Staff For NIH Lecture

Dr. Harry Eagle, Chief of the Laboratory of Cell Biology, NIAID, will be the first NIH scientist to present a National Institutes of Health lecture.

Entitled "Biosynthesis in Human Cell Culture," Dr. Eagle's lecture will be given Tuesday, February 9, at 8:15 p.m. in the CC auditorium.

This innovation in the lecture series was established to recognize NIH scientists and the role they play in the development of the bio-medical research eminence of NIH. Lectureships are awarded by the Director, NIH, on the advice of the Scientific Directors' Group.

Dr. Eagle's lecture will deal with the nutritional requirements and metabolic activities of mammalian cells. He will discuss, for example, the limited biosynthesis of essential growth factors such as cystine and inositol, as well as specific metabolic blocks in certain cell strains. Amino acid transport and protein turnover will also be discussed and the nutritional role of serum protein.

A Medical Director in the PHS
(See DR. EAGLE, Page 2)

NIAID Appoints Three To Advisory Council

The following have been appointed to the National Advisory Allergy and Infectious Diseases Council for terms beginning February 1, 1960:

Dr. Francis S. Cheever, Dean of the School of Medicine, University of Pittsburgh; Dr. Harry F. Dowling, Professor of Medicine and Head of the Department at the University of Illinois College of Medicine, Chicago; and Mrs. Irene Fitzhugh McCabe, Public Relations Director of the St. Louis Blue Cross, St. Louis, Mo.



Dr. Eagle

Plans To Be Doctor

Normal Volunteer Helps in Lab

One of the young technicians assisting in a laboratory of NHI's Section of Endocrinology is neither a PHS Commissioned Officer nor a Civil Service Employee.

Jim Conrad, 23, is a normal volunteer patient who has spent the last 16 months at NIH undergoing a variety of metabolic tests for doctors conducting research projects in NHI and NIMH. But his pre-medical courses at Goshen College and his determination to enter medical school this fall have provided him with some technical knowledge and an eagerness to learn as much as he can about his chosen field.

Jim, a member of the Memnonite
(See VOLUNTEER, Page 2)



Jim Conrad

Assistance Offered In Tax Preparation

Assistance in the preparation of Federal, Maryland, and District of Columbia income tax forms will be available to NIH employees until April 15.

Building 10: Barbara White will be in Rm. 1S229 from 8:30 a.m. to 5:00 p.m. Call ext. 2164 for Thursday appointment.

Building 1: Dorothy Wipf will be in Rm. 21 from 8:30 a.m. to 3 p.m. Call ext. 707 for Thursday appointment.

Robin Building: Either Mrs. Wipf or Mrs. White will be in Rm. 106 from 9:15 a.m. to 2:30 p.m. each Thursday through April 7.

the Record

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NEWS from PERSONNEL

Summer Employment

The Personnel Management Branch is receiving applications for summer employment from college science students who are interested in pursuing careers in research.

Each year, NIH appoints approximately 200 out of 1,000 applicants. The majority of appointees are graduate and senior level college students.

Applicants are also encouraged to apply for the Civil Service Student Trainee Examination so that they may be considered for summer jobs in other Government agencies.

Opportunities for summer jobs also exist for some applicants who have competed successfully in the Civil Service typist and stenographer examinations. Inquiries and applications should be directed to the Recruitment and Placement Section, Room 21, Building 1.

In addition to summer employment under the Civil Service system, the COSTEP (PHS Commissioned Officer Student Training and Extern Program) is receiving applications from second and third-year professional students who are interested in reserve commissions in the Corps of the Public Health Service. Information about COSTEP may be obtained from Joseph A. Staton, ext. 3381.

New Wage Board Rates

The Locality Wage Schedule in the Washington, D. C., metropolitan area, as mentioned in the last issue, has been completed and the new rates for the regular Wage Board Schedule will be effective for the pay period beginning February 7, 1960. The increase in pay for those affected will appear in the checks received March 1.

The increases range from 2c an

CREDIT UNION

(Continued from Page 1)

rectors and a Credit Committee, and at a subsequent meeting on January 21, these bodies elected officers. Officers and members are:

Board of Directors: Walter H. Magruder, NCI, President; Dr. Harold P. Morris, NCI, Vice President; John Beglin, OD, Treasurer; Clydis A. Jones, OAM, Secretary; Robert D. Murrill, DRS; Ruby H. Peters, OAM; and Dr. D. Jane Taylor, NCI.

Credit Committee: Thomas H. Keys, CC, Chairman; Lloyd J. Bankard, DRS; and Josephine O'Connor, CC.

hour at Grade 1 to 12c an hour at Grade 12, with an overall average increase of about 6c an hour.

Maternity Tax-Exclusion

A recent ruling by Internal Revenue Service allows for some sick-pay exclusions in maternity cases and may be applicable in certain instances as far back as 1956.

For purposes of the sick-pay exclusion, "sickness" exists from the commencement of labor to the time one is no longer physically incapacitated as the result of childbirth or miscarriage, and is physically able to return to work.

A statement from the physician showing the dates of this period of incapacity should be submitted in addition to the usual information required to support exclusion of sick-pay.

If such exclusion was applicable and not taken in the years 1956, 1957, or 1958, an application for refund may be requested by filing form 843 and an amended return for the appropriate year.

Scientific Careers for Women

PMB is currently working with a representative of the Department of Labor on a pamphlet describing career opportunities for women in the biological sciences. The pamphlet will outline the kinds

Foreign Scientists Are Interested In DBS Poliovirus Procedures

Recent visits to DBS laboratories by scientists from three British research institutions have pointed up the worldwide interest in control problems peculiar to the live poliovirus vaccines.

Dr. Alan P. Goffe, of the Burroughs-Wellcome Laboratories in Kent; Dr. J. A. Dudgeon, Virus Research Unit, Glaxo Laboratories, London; and Dr. Thomas Beswick, Medical Research Council Laboratories, London, were here during January to study DBS research findings.

Of particular interest were the control procedures which DBS and the PHS Committee on Live Poliovirus Vaccines are developing for the anticipated commercial use of live poliovirus vaccine, including the tissue culture and animal inoculation methods for determining its safety.

Of special interest were histologic lesions, as shown in slides, of the brains and spinal cords of monkeys inoculated with live attenuated poliovirus. These slides corroborate the data reported by DBS scientists at the WHO-PAHO Live Poliovirus Conference last year.

The report, "Comparative Virulence for Rhesus Monkeys of Poliovirus Strains Used for Oral Administration," by Murray, Kirschstein, Van Hoosier, and Baron, was recently published in the Pan American Sanitary Bureau Scientific Publication No. 44: Proceedings of the First International Conference on Live Poliovirus Vaccines, June 1959.

Virologists from Sweden, Switzerland, Ireland, Russia, and Canada have also visited DBS within the past year to study these problems.

VOLUNTEER

(Continued from Page 1)

Church, requested alternative service as a normal volunteer patient at NIH, and several of the scientists here have taken a special interest in him.

Through his work two days a week in Dr. Frederic C. Bartter's Section on Endocrinology, he has developed a keener interest in medical research, and while he is a subject of tests on glucose metabolism for NIAMD he expects to assist Dr. Stanton Segal as well.

"I've gained a lot of knowledge here," Jim said recently, "and one of the biggest satisfactions is to know that I've contributed constructively to the health and welfare of mankind."

But in spite of his interest in research, Jim still feels that he'll prefer general practice when he graduates from medical school.

of work women are doing in this field, the education and training necessary, future job possibilities, and other pertinent information. It will be distributed among students, guidance counselors, parents, and other interested persons.

Of the total number employed in the biological sciences at NIH, 410 or 35% are women; the average age is 37 and the average length of service is seven years.

Announcements

Information about the following courses has been received:

"Improving Research Organization & Performance"—American University, April 25-29;

"Communist Strategy: Its Basis in Theory & Practice"—Foreign Service Institute, Department of State; two weeks, repeated month-

DR. EAGLE

(Continued from Page 1)

Commissioned Corps, Dr. Eagle directed the PHS Venereal Disease Research Laboratory at Johns Hopkins Hospital for 10 years. His early research interest in syphilology is reflected in the serologic test which bears his name.

In 1946 his research group was renamed the Laboratory of Experimental Therapeutics because of their interest in the mode of action of the new antibiotics.

In 1947 Dr. Eagle came to NIH as the first Scientific Director of NCI. Two years later he returned to full-time research in what was then the National Microbiological Institute, now NIAID.

In his present capacity Dr. Eagle is working on problems related to nutritional requirements and metabolic activities of mammalian cells. He has published over 250 scientific papers during his career.

Honors awarded Dr. Eagle include an Honorary Master of Science degree from Yale University, the Alvarenga Prize of the College of Physicians of Philadelphia, the Eli Lilly Award in Bacteriology, and the Presidential Certificate of Merit.

A past president of the Society for American Bacteriologists, Dr. Eagle is also a member of the American Society for Pharmacology and Experimental Therapeutics, the Society for Experimental Biology and Medicine, the American Association of Immunologists, and the American Society of Biological Chemists.

ly.
For further information, contact the Employee Development Section, Building 1, Room 21.

Science Section

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

Asian Flu Outbreaks Speed Research, Vaccine Release

The current influenza outbreaks have caused increased research activities at NIH and elsewhere. At press time, outbreaks had been reported from many States, and the A₂ (Asian) strain had been identified in seven of them and the District of Columbia.

In order to facilitate the release and distribution of the approximately 2.8 million doses of influenza vaccine now in various stages of production, the Division of Biologics Standards has advised all manufacturers that, as a temporary measure, determination of potency may be made on the basis of the chicken cell agglutination test (CCA) instead of the usual mouse protection test.

CCA Test Is Faster

The mouse protection test is based on the capacity of the vaccine to elicit antibodies in mice with graduated doses of vaccine and requires 24 days for completion. The CCA test, which measures the inactivated viral content in the test tube, can be completed in less than two days. Although animal tests are more acceptable measures of vaccine potency than *in vitro* tests, experience over the past several years indicates that the CCA test correlates well with the mouse protection test.

The approximately one million doses of vaccine presently available contain the Asian strain as well as other A strains—PR8 and

Ann Arbor 1-57—and one type B strain—the Great Lakes. The prevailing type of influenza this season appears to be caused by the Asian strain. However, the many scattered outbreaks indicate a wide seeding of the virus.

Increased support for influenza research to permit investigators to take advantage of the study opportunities afforded by the current outbreaks was announced by Surgeon General Leroy E. Burney of the Public Health Service.

Methods to stimulate research during the current influenza season and to encourage long-range research in influenza and related diseases were developed when Dr. Burney called together the Service's Committee of Investigators which is composed of some of the nation's leading authorities on influenza and related diseases. The meeting was held at NIH.

Research Accelerated

Members of the Committee agreed to accelerate their own research during this influenza season and to encourage other investigators to conduct influenza studies. All influenza research proj-

ects will receive special review at the National Institutes of Health, and qualified projects will be approved rapidly.

Types of problems cited by the Committee as needing study are:

a. Assessment of the value of vaccine given in the 1957 epidemic as to its possible degree of protection at the present time;



2 DAYS—In this step of the CCA test, which takes altogether less than 2 days, washed chicken red blood cells are added to a mixture of influenza virus and dilutions of human sera to test for antibody in the sera.

b. The present degree of immunity of unvaccinated individuals who had influenza in the 1957 epidemic;

c. The physiological effects of influenza on cardiovascular and respiratory systems;

d. The neuromuscular effects of influenza.

Investigators who participated in studies during the 1957 epidemic have been alerted to the accelerated project review and approval mechanism.

The Committee of Investigators was established on the recommendation of the Surgeon General's Advisory Committee on Influenza Research. The Influenza Research Committee continued to function after the Asian Influenza Epidemic of 1957. It stressed that one of the major problems of influenza research is to maintain a competent corps of investigators with a continuing interest in research in this disease between epidemic periods. A plan for a Committee of Investigators with continuing interest in influenza research was approved by the Councils of the National Institutes of Health and by the Surgeon General in the fall of 1959.

Committee Named

Members of the Committee of Investigators are: Dr. Robert Wagner, University of Pennsylvania, chairman; Dr. George Burch, Tulane University; Dr. Fred M. Davenport and Dr. Thomas Francis, University of Michigan; Dr. Ivan Bennett, Johns Hopkins University; Dr. George Hirst, Public Health Research Institute of the City of New York, Inc.; Dr. Maxwell Finland, Boston City Hospital; and Dr. Roderick Murray, National Institutes of Health.

Understanding Gained In Metabolic Fate Of Phenylalanine

Further studies of the mechanism of the enzymatic conversion of phenylalanine to tyrosine, conducted by Dr. Seymour Kaufman of National Institute of Mental Health's Laboratory of Cellular Pharmacology, have brought increased understanding of the metabolic fate of this substance whose faulty metabolism results in phenylketonuria, a condition often leading to a severe form of mental retardation.

One study, reported in the *Journal of Biological Chemistry*, dealt with the enzyme system which catalyzes the oxidation of phenylalanine to tyrosine. The system involves two enzymes; one purified from rat liver and the other from sheep liver extracts, in addition to oxygen, TPNH, and any one of several tetrahydropteridines.

The other study, reported in *Biochimica et Biophysica Acta*, dealt with the participation of tetrahydrofolic acid in the enzymic conversion of phenylalanine to tyrosine. Dr. Kaufman has identified dihydrofolic acid as the product of oxidation of tetrahydrofolic acid by the phenylalanine oxidase system. Tetrahydrofolic acid serves as an electron donor in this reaction and appears to be similar in structure and function to the natural, as yet unidentified cofactor.

Catechol-O-methyl Role In Inactivation of Norepinephrine Shown

Further evidence of the way in which the body inactivates epinephrine and norepinephrine was provided in a study focused on the contribution of pyrogallol to this process. In a report published in *Science*, Dr. Julius Axelrod of the National Institute of Mental Health Laboratory of Clinical Science and Dr. Marie-Jeanne Laroche, NIH postdoctoral fellow now at the Institut Pasteur in Paris, present evidence pointing to catechol-O-methyl transferase as the enzyme mainly involved in the inactivation of the neurohumor norepinephrine in the sympathetic nervous system.

Pyrogallol inhibits the O-methylation of epinephrine and norepinephrine by catechol-O-methyl transferase *in vitro* as well as the metabolism of these catecholamines, and the formation of their O-methylated metabolites, in the intact mouse. Since pyrogallol also prolongs the physiological effects of epinephrine, it is suggested that catechol-O-methyl transferase terminates the actions of the catecholamine hormones.



24 DAYS—This is one part of the 24-day long mouse protection test for potency of influenza vaccine. This mouse in DBS laboratories is having drops of influenza virus and influenza antigen put in his nose. Survival of the mouse during 10 days of observation is evidence of an effective anti-serum, and indicates the vaccine used in its production meets requirements for potency.

Virology Holds Promise for Solution of Cancer Problem

From Heimeman Foundation Lecture given by Dr. John E. Heller, Director, National Cancer Institute, at Charlotte, N. C., January 26.

There is no doubt that virology now holds the most promise in research efforts on cancer causation and prevention.

Of course, virology has but recently attained this high status. Only in the past few years has the accumulated evidence of a half-century of investigation proved sufficient to convince the more skeptical scientists that viruses cause cancer in animals.

The French bacteriologist Borrel was the first to make the suggestion, in 1903, that cancer might be a viral disease. His countryman, the eminent virologist Charles Oberling, has since pointed out that Borrel reached this conclusion when he failed to find the "microbe of cancer." For years

certain wild cottontail rabbits.

Using the same basic technique employed by Rous, Shope extracted and filtered the papilloma tissue, and injected the filtrate into domestic rabbits. The Shope papilloma agent cannot be recovered from the tumors in the domestic rabbit; the animal can be infected with a filtrate, but the papillomas that arise cannot be transmitted from one domestic rabbit to another. Nevertheless the presence of a virus is signified by the appearance of antibodies in the blood as the tumor develops.

VIRUS-CANCER RESEARCH, 1903-1936

- 1903 - BORREL, first suggested viruses cause cancer
- 1908 - ELLERMAN and BANG,)
- 1911 - ROUS,) Discovered animal virus tumors
- 1933 - SHOPE, solid tumor in rabbits
- 1934 - LUCKE, kidney cancer in frogs
- 1936 - BITTNER, breast cancer in mice

his idea was defensible "mainly because no other offered a satisfactory interpretation."

Then, in 1908, the Danish scientists Ellerman and Bang succeeded in transmitting leukemia from one chicken to another by injecting cell-free filtrate of blood and organ extracts. At that time, however, leukemia was not generally considered a neoplastic disease, so their work did not receive much attention.

Two years later, Peyton Rous, working at the Rockefeller Institute in New York, transferred certain spontaneous tumors of chickens by cell-free filtrates. One of these neoplasms was the source of the "Rous Sarcoma." This work was viewed with some skepticism, due to the prevailing opposition to an infection theory, but subsequent work established beyond any doubt that these were true neoplasms, and that there were no living tissue cells in the filtrate. Now we know that Rous' discovery marked an important stage in the history of experimental cancer research.

In the early thirties, a young man named Richard Shope, also at the Rockefeller Institute, was studying rabbit tumors—in particular, a papilloma occurring in

birth, if it was to develop cancer. Thus was discovered the Bittner milk agent, now accepted as a virus.

These, then, were the early pioneers of virus-cancer research—Borrel, Ellerman and Bang, Rous, Shope, Lucke, Bittner. But it was a long time before their results were generally considered to be anything but isolated laboratory curiosities. Other paths of cancer research appeared vastly more promising than virology.

In the last decade, however, a number of investigators have become interested in virus-cancer research, and have produced an impressive amount of information about animal tumor viruses and the fundamental nature of viruses and cell components.

Recent Studies

The beginning of this new, active period is marked by a study by Dr. Ludwik Gross, of the Bronx Veterans Administration Hospital, who in 1951 successfully transmitted mouse leukemia with filtered extracts by injecting new-born mice of a susceptible strain. His best results were obtained when he inoculated mice no more than 16 hours old. Gross also reported an unexpected result—some of the inoculated mice developed tumors of the parotid, or salivary gland and miscellaneous other types. Such tumors rarely, if ever, occur spontaneously in uninoculated mice of this strain.

At the National Cancer Institute, Sarah Stewart attempted to reproduce Gross' results. But, although she used the same method, none of the mice she inoculated got leukemia. They developed parotid gland tumors instead.

Teaming with Bernice Eddy, also at the National Institutes of Health, Dr. Stewart increased the

potency of the parotid tumor filtrate by carrying it in tissue culture.

Many Tumors Develop

When new-born mice were injected with this filtrate, the results were remarkable. Not only did the mice develop primary parotid tumors, but 22 other types of tumors as well, including tumors of the thymus, adrenal glands, and mammary glands. The agent was thus named "polyoma virus." Some of the mice developed tumors within 6 weeks. Again, no leukemia developed. The investigators obtained similar results when they inoculated mice with mouse leukemia extracts incubated in tissue culture.

It is now widely believed that Gross' original material contained two viruses—the leukemia virus and the "polyoma virus."

Stewart and Eddy have also shown that the polyoma virus has the unusual ability to cross animal strains and species barriers, for, though a mouse virus, it produces tumors in hamsters and rats as well.

A study conducted at the Sloan-Kettering Institute for Cancer Research in New York City about three years ago shed new light on the virus-tumor relationship in animal leukemia. Dr. Charlotte Friend reported her discovery of a virus that induced leukemia in adult as well as infant mice within 2 to 3 weeks after inoculation.

Virus Principle Supported

Dr. Joseph Beard, the eminent virologist at Duke University, has pointed out that the studies by Friend and Gross have "firmly established the principle of virus etiology of well-known examples of mammalian leukemia." And, he adds, "there now exists a consid-

VIRUS-CANCER RESEARCH, 1951-1959

- 1951 - GROSS, leukemia in mice
- 1956 - STEWART and EDDY, multiple tumors in mice, rats, and hamsters
- 1957 - FRIEND, leukemia in mice
- 1957 - FRIEND, immunized mice against leukemia
- 1957 - BURMESTER, immunized chickens against visceral lymphomatosis
- 1957 - SCHWARTZ, enhanced mouse leukemia by injection of human leukemia tissue
- 1957 - DMOCHOWSKI, observed virus particles in human leukemia tissue
- 1958 - STEWART and EDDY, immunized hamsters against polyoma virus
- 1959 - MOLONEY, leukemia in mice

AIDS TO VIRUS-CANCER RESEARCH

Handling Viruses

- 1910 - CARREL and BURROWS,) first growth of cancer
 1910 - VOLPINO,) cells in tissue culture

Understanding The Nature of Viruses

- 1927 - BUSCH, development of the electron microscope
 1939 - STANLEY,)
 1952 - ZINDER and LEDERBERG,) discoveries of the chemistry
 1956 - FRAENKEL-CONRAT,) and biology of viruses
 1956 - GIERER and SCHRAMM,)

erable body of information which is not only compatible with the hypothesis of the viral etiology of human leukemia, but which provides a substantial and reasonable background for pursuing investigations in man."

Leon Dmochowski, who with the electron microscope directly visualized viruslike particles in a variety of mouse and chicken tumor tissues, has conducted some interesting studies on human leukemia. In a collaborative study at the M. D. Anderson Hospital and Tumors Institute, in Texas, Dmochowski reported seeing viruslike particles in a biopsy from an enlarged cervical lymph node of a patient with acute lymphatic leukemia. He also reported that cells in the lymph nodes had undergone a number of changes similar to cell changes in affected organs of mouse leukemia and chicken lymphomatosis. Visceral lymphomatosis is a common malignancy of chickens, known to be caused by a virus.

New Development

Several months ago, one of our scientists at the National Cancer Institute reported a discovery that is, I believe, a real landmark in virus-cancer research. It is a fascinating story, beginning with John Moloney's studies of the properties of Sarcoma 37, an experimental mouse tumor. In the course of his investigation, Dr. Moloney prepared a cell-free extract of the tumor and injected it into healthy mice. The result was quite unexpected. Within eight months, the animals developed a type of leukemia that is indistinguishable from spontaneous leukemia in mice.

Following this lead, Moloney prepared extracts from leukemia tissue of the mice that first developed the disease, and injected these extracts into mice. By repeating this process several times, he obtained an extract so virulent that it caused leukemia within 10 weeks in 100 percent of the mice injected on the first day of life.

The leukemia agent is a virus,

and it has been seen under the electron microscope. Unlike other mouse leukemia viruses, the Moloney virus causes the disease in several different strains. It is also active against adults as well as newborn animals.

None of the mice has developed any form of cancer except leukemia.

Many Discoveries

Along with the numerous reports of new animal tumors, there have been many discoveries—often seemingly unrelated—in research on virus and cell constituents, their modes of behavior, and other characteristics. We have recently come to see that all these results are very likely pieces of the same large and intricate puzzle.

This realization in itself has been greatly responsible for the acceleration and vitality of virus-cancer research today. At the same time, the present phase of research in this field presents a number of problems and obstacles that demand wise and careful attention. With this need in mind, 15 distinguished scientists met at the National Institutes of Health about a year ago to explore new approaches in virology and other sciences that might lead to major advances in human cancer. The group made four proposals: 1) basic study of viruses and animals, using electron microscopy and available animal tumors as models; 2) greater emphasis on training of biologists, zoologists, and chemists in the basic medical sciences related to the problem; 3) improvement of sources and distribution among laboratories of living host and viral materials; and 4) expanded financial support to include large-scale interdisciplinary explorations over long periods of time. These are excellent suggestions, and most of them have already been acted upon.

Recent Conference

A second conference on the problems of research on viruses and human cancer was held this past November in Rye, New York.

Sponsored by the American Cancer Society, the meeting was attended by many of the Nation's leading virologists, most of them grantees of the National Cancer Institute.

Establishing the role of viruses in human cancer might seem a simple matter of finding virus in malignant tissue and then demonstrating that it caused the disease. However, there is a fundamental problem here: at the present time we have no way to demonstrate the carcinogenic effect of viruses on humans. We must, therefore, develop laboratory techniques that will attack the problem indirectly.

Tissue Culture Important

A key tool in the development of such techniques will probably be tissue culture. The number of laboratories where human cells are being grown in tissue culture has greatly increased in recent years, thus facilitating the search for and study of viruses in human tissue.

In other words, Bryan's work makes it possible to refute the old argument that a tumor cannot have been caused by a virus if the virus cannot be extracted.

As the discussions at Rye emphasized, one of the principal questions that must be answered is, how do viruses enter a cell and make it cancerous? For many scientists, studies on nucleic acids offer the most promise in this area. In cells, as you know, the nucleic acid DNA is localized in the chromosomes, which carry the genetic information of cells and determine their form and function. Cells also contain another form of nucleic acid, RNA, most of which is in the cytoplasm.

Viruses are known to consist largely of nucleic acid—either DNA or RNA—and protein. But until fairly recently it was not known whether nucleic acid alone could be responsible for virus activity. Then, almost simultaneous-



In the wing of this chicken is the Rous sarcoma 10 days after inoculation of the most potent Rous sarcoma virus preparation available at the present time.

Research of this nature is making wider use of techniques such as treatment with X-ray or cortisone that permit human tissue to grow in experimental animals.

Other fundamental studies are equipping us with knowledge of the relationship between the host animal and the virus. Dr. Ray Bryan, at the National Cancer Institute, has conducted some revealing studies on the Rous sarcoma virus in chickens. He has shown that there is a quantitative relationship between the amount of virus inoculated and certain biological properties of the tumor—such as size, length of time before the tumor develops, and length of time before it kills the animal.

ly, Fraenkel-Conrat at the Berkeley Virus Laboratory and Gierer and Schramm, in Germany, found that the RNA of the tobacco mosaic virus showed infectious activity.

This work pointed up the vital role of nucleic acid in virus activity, and of course, the possible role of nucleic acid in cancer.

Just this month, scientists at Sloan-Kettering and the National Institutes of Health reported that DNA has been isolated from the polyoma virus discovered by Stewart and Eddy. This is the first clearcut evidence that an isolated viral DNA can produce cancer.

(Continued on Page 6, Column 1)

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This strongly indicates that DNA can enter a living cell and change the DNA of the cell to make it cancerous.

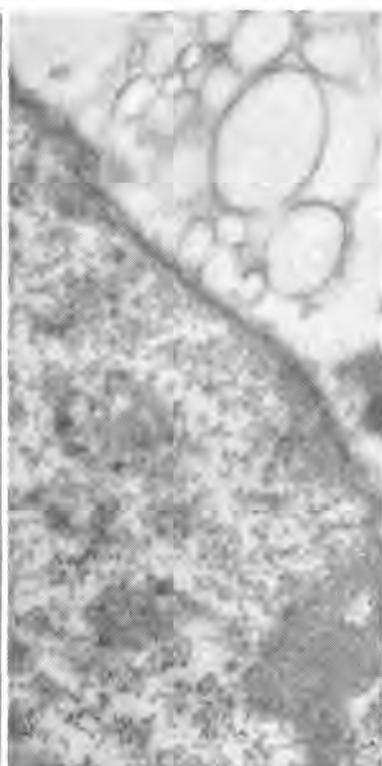
Such work has breath-taking implications, and it acts as a powerful stimulus to the scientific imagination. Studies on bacteria and bacterial viruses have shown that genetic material, and thereby hereditary traits, can be transferred by a virus from cell to cell, by a process known as transduction. This transfer might cause an abnormal, malignant change in the cell. Or, a viral nucleic acid might shed its protein coat and enter a cell, become incorporated into the genetic structure of the cell, and modify it so that the cell begins to reproduce abnormally. Bacteria studies also support the concept that latent viral nucleic acid in a cell might be activated by chemical or physical agents, and thus initiate malignant growth.

These possibilities, and many others, constitute a broad challenge to the scientific community as a whole. Intense, collaborative efforts in many disciplines—genetics, cellular biology, chemistry, immunology, to cite just a few—are needed. The National Cancer Institute is encouraging such activities through a greatly expanded program of grant support for virus-cancer research. Some of the investigators participating in this program are virus experts entering the cancer field for the first time. Emphasis is on the long-term support of the scientist himself, as opposed to support of a specific project, and support of some of our grantees in this field has been recommended for periods up to 10 years. I believe that these practices, which were recommended by our advisors, will help to insure the most productive work possible in virus-cancer research.

If viruses do cause cancer in man, and if these viruses are isolated, what then? How will we apply our knowledge to help save lives?

Vaccine Work

Naturally, prevention is what we look to as an end result of all cancer research. There has been some success in developing vaccines against virus-caused cancer in animals. Stewart and Eddy have devised a procedure that immunizes hamsters against polyoma virus. Friend has developed a formalin-killed vaccine that protects mice challenged with live leukemia virus. And successful vaccines against visceral lymphomatosis in chickens have been developed by Dr. Ben Burmester of the Department of Agriculture's Poultry Research Laboratory in Michigan. On the other hand, attempts to detect antibodies against the Moloney virus have been unsuccessful,



Portion of the nucleus of a tissue culture cell containing many polyoma particles. Nuclear membrane and cytoplasm are at the upper right. X 20,000.

ful, and have therefore hindered work on the development of a vaccine from this virus. This illustrates the point that isolation and identification of a cancer-producing virus may not lead to the speedy development of a vaccine.

It may be possible, someday, to produce a vaccine that will prevent cancer from developing in man. It might, of course, take years to determine its effectiveness, unless a vaccine for acute leukemia were developed. In that case, the effect of a vaccine given to babies would soon be obvious, since as we know so well, acute leukemia most often strikes young children.

If human cancer is a virus disease, another approach might be the use of drugs designed to destroy the virus either before it induced cancer or very early in the course of the disease. Laboratory studies of a virus that infects bacteria have shown that selective action by such drugs is possible. The virus studied induces the formation of a particular enzyme necessary for the reproduction of the virus within the cell. A powerful anticancer agent, 5-fluorouracil deoxyriboside, will seek out this enzyme—which is, of course, only in the bacteria infected by virus—combine with it, and thus block the reproduction process.

Some intriguing studies of cancer treatment in humans have shown that infection of cancer cells with certain viruses destroys some of the cells. The effect is, of course,

Grow Two Cell Lines From Single Mouse Cell

Previous reports by Dr. Katherine K. Sanford and her colleagues in the National Cancer Institute's Laboratory of Biology have described results of studies of two cell lines grown in tissue culture from a single mouse cell.

These cell lines possess marked differences in morphologic, metabolic, and growth characteristics. When implanted into mice of the inbred strain of origin, cells from the "high" line grow into malignant tumors in 97 percent of the mice; cells from the "low" line form tumors in only 1 percent.

By studying pure strains of cells (clones) each grown from a single cell, these investigators have now concluded that the two lines do not differ in the proportion of malignant, transplantable cells that they contain, but rather possess entirely different heritable characteristics. This accounts for the low incidence of "takes" and the prolonged latent period for tumor development *in vivo* shown by the "low" line.

Details of the present study are given in a paper appearing in a recent issue of the *Journal of the National Cancer Institute*. Co-authors with Dr. Sanford are Dr. Ruth Merwin, Gwendolyn L. Hobbs, and Dr. Wilton R. Earle, of the same Laboratory, and James M. Young, of the National Naval Medical Center, Bethesda.

Results of investigations of the metabolic properties of these clones are summarized by Drs. Mark W. Woods and Dean Burk, of the Laboratory of Bio-

temporary, since the patient soon develops antibodies against the virus. In further studies, attempts are being made to inhibit the host's production of antibodies against these viruses, to develop methods of reaching the cancer with sufficiently powerful doses before antibodies develop, and to produce tumor-destroying properties in other human viruses.

New Era

I hardly need to say that virus-cancer research has come a long way in the past 50 years. And the efforts of dedicated scientists in countries all over the world assure us that our knowledge of this complex field will steadily increase. This is indeed a new era—one in which we are continually having to re-evaluate and readjust our concepts. It is difficult to imagine what new finding may be just beyond today's horizon. But I am sure it is no mere dream that research on viruses and cancer may eventually give us valuable new knowledge and skill that will help to prevent or arrest the development of many human cancers.

chemistry, and Drs. Sanford and Earle in another paper in the same journal. The "high" line and the clones derived from it utilized approximately three times as much glucose as the "low" line and its clones. The clones derived from the "low" lines were less uniform. One showed glycolytic activity intermediate between that of the "high" and "low" line cells, and thus appeared to be an intermediate in the progression toward an increased glycolytic capacity *in vitro*.

Scientists Find New Histidine Metabolites And Other Compounds

Several new metabolites of histidine in addition to previously known and isolated compounds have been discovered by Drs. Donald D. Brown and Marian W. Kies of National Institute of Mental Health's Laboratory of Clinical Science.

In one study, reported at the last meeting of the American Society of Biological Chemists, the investigators described an unknown compound which appeared among the urinary metabolites following intravenous injection of uniformly radioactive C-14-1-histidine in a female *Macaca mulata* monkey.

The new metabolite, which represented at least 14 percent of the urinary radioactivity, had marked acidic properties and was not on the histamine or urocanic acid pathway of histidine degradation. Although the unknown compound still contained the second carbon of the imidazole ring of histidine, it did not possess an intact imidazole nucleus.

Several other related studies by these investigators and their colleagues in the Laboratory of Clinical Science on the mammalian metabolism of histidine have been published in the *Journal of Biological Chemistry*. One paper describes the enzymatic formation of *L*-hydantoin-5-propionic acid from histidine via the urocanic acid pathway.

Another deals with the enzymatic formation, stabilization, purification, and properties of 4(5)-imidazolone-5(4)-propionic acid, the product of urocanase activity.

A third report describes the method which they have developed to separate and measure the radioactive metabolites of *L*-histidine-C¹⁴ in the urine of the monkey, the human, and the rat.

Dr. Shock Is Honored For Gerontology Work

Dr. Nathan W. Shock, Chief, Gerontology Branch, NHI, received the 1960 Modern Medicine Award for Distinguished Achievement.

Cited for his "investigations of the physiology of growth and aging and unique and thorough indexing of gerontologic literature," Dr. Shock is one of a group of 10 outstanding medical researchers, educators, and clinicians selected for the yearly honor.



Dr. Shock

Nominations for the award are made by readers of the journal *Modern Medicine*, deans of medical schools, and officers of national medical organizations. Portraits and brief biographical sketches of Dr. Shock and the other award recipients appear in the January 1 issue of the journal.

Aging Is Discussed On TV's 'Conquest'

Dr. Nathan Shock, Chief of the Heart Institute's Gerontology Branch, starred in the CBS television program, "Conquest," on Sunday, January 17. The telecast, narrated by Charles Collingwood, was filmed in the laboratories of the branch at the Baltimore City Hospitals.

One of the scenes was shot in the Physiological Testing Lab, where Dr. Shock discussed the need to obtain more detailed physiological data on the aging process, and presented viewers with various demonstrations of aging animal muscle tissue, methods of counting cells, cell reproduction and enzyme activity.

Staff Members Participate

Participating in the program with Dr. Shock were Drs. Arthur Norris, Joseph Falzone, Irvin Konigsberg, and Charles Barrows, all of the Gerontology Branch.

Dr. Shock stressed, in the program, that while we cannot prevent old age, we may succeed in acquiring knowledge that will help us add a few more productive years to the average person's life span.

What we can and should do now, he said, is to recognize "that the older person has a potential for usefulness far greater than our present society is geared to accept. Right now, the best remedy I know for aging is to make use of our older people. There's noth-

Men from 23 to 98 Volunteer For NHI Gerontology Studies

One of the studies being conducted by the Gerontology Branch, NHI, is designed to determine the changes in various human physiological, psychological, and biochemical capacities with increase in age.

Participants in the study are 250 men between the ages of 23 and 98 who have volunteered to be tested every 18 months for the



rest of their lives. Tests include estimates of lung, heart, and kidney functions, basal metabolism, nutritional requirements, speed of reactions and responses to standardized exercise, and psychological tests to measure intelligence and attitudes.



Two of the volunteer participants in the Gerontology Branch's aging study are senior agricultural scientists working at the USDA Plant Industry Station at Beltsville, Md. Dr. C. Roy Adair, left, is performing a maximal breathing capacity test with the assistance of technician John C. Melvin. Wallace Ashby, right, grips a hand dynamometer to test the muscle strength in his left hand.

SYMPOSIUM

(Continued from Page 1)

the Albert Einstein College of Medicine's Program on Aging. Both of these activities are partially supported by NIH grants.

Of particular interest was Dr. Handler's presentation, in which he discussed radiation effects and their similarities to physiologic aging. Dr. Handler has been one of six leaders in a series of conferences supported jointly by the National Heart Institute and the Atomic Energy Commission on the subject of radiation and aging.

ing ages a man faster than being farmed out to pasture when he still has something to contribute.

"Wisdom, judgment, experience are as irreplaceable to the life of society as are a handful of cells to the life of a man. All we can do, as scientists, is to try to answer the whys and wherefores of aging—to try to find out how a man can live a few years longer, and how his later years can be less biologically troubled. All this adds up to nothing if we aren't prepared to recognize that as long as a man has something to give, he has the right to continue to do so."

NIAID Staff, Grantees Speak at N.Y. Meeting

Three NIAID scientists participated recently in the two-day Second Conference on Medical Mycology sponsored by the New York Academy of Sciences. Held in New York City, January 11 and 12, the meeting attracted participants from Indonesia, Portugal, and France, as well as this country.

Dr. Chester W. Emmons, Head of the Medical Mycology Section, Laboratory of Infectious Diseases, spoke on cryptococcosis. Drs. Herbert F. Hasenclever and George W. Lones, of Dr. Emmons' staff, presented papers on experimental cryptococcosis, and the physiology of *Coccidioides immitis*, respectively.

Eight grantees of NIAID, all working in the field of mycoses, spoke at the conference. These were Dr. Albert M. Kligman, University of Pennsylvania Medical School; Dr. Jan Schwarz, Jewish Hospital, Cincinnati; Dr. Howard W. Larsh, University of Oklahoma; Dr. S. Gaylen Bradley, University of Minnesota; Dr. Lorraine Friedman, Tulane University; Dr. E. Edward Evans, University of Alabama Medical Center; Dr. Stan-

Dr. Powell to Serve On Radiation Council

Dr. Clinton C. Powell, Assistant Grants Branch Chief for Clinical Research, DRG, has been appointed by PHS Surgeon General Leroy Burney to serve as the DHEW representative on the working committee of the inter-agency Federal Radiation Council.

Established by Executive order in August, 1959, the Council will formulate policies and make plans for investigation into the field of radiation damage, exposure, and health hazards.

Prior to his appointment 11 months ago to his present post, Dr. Powell was Executive Secretary of the Radiation and Surgery Study Sections, DRG. He came to DRG in 1958 from the Division of Special Services, where he was Chief of the Radiological Health Medical Program.

CONFERENCES

(Continued from Page 1)

conducted prior to a state-wide aging conference at the University of Maryland on September 7-8.

Senator Pat McNamara of Michigan, Chairman of the Senate Subcommittee on Problems of the Aged and Aging, was the principal speaker at the conference here. Mrs. Schweinhaut and Thomas B. Finan, Maryland Secretary of State, also addressed the group.

The Center for Aging Research, DGMS, provided technical assistance in planning the conference.



Senator Pat McNamara, of Michigan, and Margaret C. Schweinhaut, Delegate to the Maryland General Assembly, get together in the CC lobby during the recent Maryland regional conference on the problems of the aging.

ley Marcus, University of Utah; and Dr. Frank Roth, University of Miami Medical School. Subjects included experimental mycoses, epidemiology, biochemistry and physiology of fungal diseases, immunology of mycoses, and therapy of systemic infections.

NIAID Researchers Attend Symposium

Five NIH scientists participated in the Gustav Stern Symposium on virus research in New York City on January 25 and 26.

Dr. James E. Darnell of the Laboratory of Cell Biology, NIAID, presented a paper on some basic laboratory aspects of poliovirus. Three scientists of NIAID's Laboratory of Infectious Diseases—Drs. Robert M. Chanock, Robert J. Huebner, and Wallace P. Rowe—discussed their studies on respiratory viruses and on virus related to cancer.

Dr. Howard B. Andervont, Head of the Laboratory of Biology of NCI, moderated an evening seminar on criteria for recognition of tumor-causing oncogenic viruses in man.

Among the discussants were seven Nobel Prize winners who have worked in the field of virology.

OBITUARIES

James L. Fugitt, 51, a laboratory animal caretaker in the Laboratory of Chemical Pharmacology, NCI, died during surgery on January 15. He had been at NIH since 1956. A resident of Silver Spring, he is survived by his wife, Marie Mary Fugitt.

Clifton M. Burroughs died of cancer January 6 in Montgomery County General Hospital. He was a laboratory animal caretaker in the Laboratory of Biology, NCI, and had been at NIH since 1946. He is survived by his wife and son.

Ann E. McHugh, NIDR, died December 31 at Surburban Hospital. One of the first new employees to enter NIDR after its establishment, Mrs. McHugh served in the Institute's Administrative Office from 1949 until 1956, and from then until recently in its Information Office. Requiem Mass was held January 4 at St. Mary's Church in Rockville.

Otto R. Saunders, 41, died suddenly December 30, at District General Hospital. A laborer in the Transportation Unit, CC, he had been employed at NIH since 1955. Mr. Saunders, a Washington resident, is survived by his wife, Florence.

Marvin E. Ford, 35, a laborer in the Transportation Unit of the CC, died suddenly December 30 at Walter Reed Army Medical Center. Mr. Ford had been employed at NIH since 1955. Among his survivors are his parents, Mr. and Mrs. L. M. Ford, with whom he made his home, and a brother,

WHERE IS IT?



Out on a country road? Not at all. It's part of NIH's mail system. Located near the intersection of Center Drive and Service Road South, in front of Bg. T-19, this box holds mail for the Robin and Arts Buildings in Silver Spring. The shuttle bus collects about 250 packages of mail here each week for those buildings.

Miss Anderson Named For Intern Program

Helen Anderson, NIDR Assistant Administrative Officer, was recently selected for enrollment in the Civil Service Commission Middle Management Intern Program. Her appointment was one of two from DHEW. The program began January 11 and ends June 3.

Recently elected President of the NIH Recreation and Welfare Association, Miss Anderson earned an A.B. in business administration in 1950. She entered NIH in 1949 and has been with the Dental Institute since March of 1958.

Clarence, who is employed in the CC Nursing Department.

George Boone, 42, died in District General Hospital, December 31. A warehouse tractor operator in the Transportation Unit, OAM, he had been employed at NIH for the past nine years. Mr. Boone was a resident of Washington.

Willis C. Clem, 46, a fixed industrial equipment operator in the Plant Engineering Branch, DRS, died December 14 at his home in Rockville. He had been employed at NIH since 1955.

A. J. Belton, 39, died suddenly at his Washington residence December 30. Mr. Belton, who had been employed at NIH since 1953, was an elevator operator in the Housekeeping Section, CC. Survivors include his wife and three children.

NIAMD Scientists On Local TV Show

Biochemistry and its place in basic research will be discussed on a half-hour television program February 5 by Dr. DeWitt Stetten, Jr., Associate Director in Charge of Research, NIAMD.

Titled "The Biochemical Basis of Disease," the program will be carried by Station WTTG, Channel 5, at 11:30 a.m.

Color films in which certain NIAMD laboratory techniques are demonstrated by members of his staff will be used by Dr. Stetten in his presentation. Subjects will include Paper Strip Scanning in Radioisotope Studies, demonstrated by Dr. Frank Eisenberg, Jr.; Circular Paper Chromatography, demonstrated by Dr. Irwin G. Leder; and Use of the Mass Spectrometer, demonstrated by William B. Comstock.

The program is sponsored by the Television Department of Walter Reed General Hospital.

New Booklet Reviews Research on Strokes

Little Strokes—Hope Through Research, a brochure prepared by NINDB, was issued last month, and already there have been "hundreds of requests" for the booklet.

Stressing the importance of prompt diagnosis of little strokes, the booklet tells the story of stroke patients who have survived their attacks to live long, useful lives.

"Little Strokes" reviews research currently being conducted by NINDB, and summarizes similar research supported through grants to non-Federal hospital and medical centers.

Listed as Public Health Service Publication No. 689, single copies of the booklet may be obtained from NINDB. Quantity orders cost \$7.50 for 100 copies and may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

DRS Clearance Needed To Visit New Buildings

Contractors and Public Buildings Service officials have complained to the Division of Research Services that the large number of NIH visitors to the DBS building, now nearing completion, is interfering with construction operations and is a hazard to the visitors.

Since contractors are responsible for accidents that occur on the jobs and for any damage to equipment prior to a building's completion date, they are justified in their request that NIH limit visitors inside the building to those who have official business.

In order to meet this require-

Five Are Appointed To NIH Positions

Dr. Harold Baer has been appointed Chief of the Allergy and Sensitivity Section, Laboratory of Bacterial Products, DBS. He assumed his duties on January 4.

Dr. Baer has been a professor at the Tulane University Medical School's Department of Microbiology since 1950. He is a member of the American Association of Immunologists, the American Academy of Microbiology, the Society of American Bacteriologists, the American Chemical Society, and Sigma Xi. He has published a number of papers in the field of immunochemistry of the human blood group substances.

Samuel M. Poiley, Chief, Animal Production Section, Laboratory Aids Branch, DRS, has been appointed to a new position in the Cancer Chemotherapy National Service Center, NCI.

A graduate of Johns Hopkins University, in business administration, Mr. Poiley has been with NIH since 1935. In his new position he will be responsible for the development and coordination of a program of production and procurement of laboratory animals to be used in screening drugs for anticancer activity.

Dr. Charles W. McPherson has been selected to replace Mr. Poiley as Chief of the Animal Production Section. A graduate of the University of Minnesota with a D.V.M. degree, Dr. McPherson was a general practitioner before entering the Public Health Service. He has been with NIH since 1956.

Anna E. Dougherty was made Assistant Chief, NIH Library, Scientific Reports Branch, DRS, December 21. Miss Dougherty formerly was with the National Library of Medicine as Head, Special Language Unit, Catalog Division. She had been with NLM since 1951.

Dr. Joe W. Atkinson, D.V.M., will become Assistant Chief, Laboratory Aids Branch, DRS, on February 15. Dr. Atkinson is currently serving as Acting Assistant Chief, Food Sanitation Section, Milk and Food Program, Division of Engineering Services, BSS, PHS. He has been a member of the Commissioned Corps of the Public Health Service since July 1, 1952.

ment, personnel having an official need to visit the DBS building or other NIH construction projects are requested to obtain clearance through Alfred E. Williamson, Chief, Research Facilities Planning Branch, Building 13, Room 21313.