



MEMORANDUM

TO: ✓ Dr. Roy C. A. Bock
Dr. J. Gordon Burdick
Dr. Alvin Davis
Dr. Lester W. Sanders
Dr. Leslie J. Schradin
Dr. Carl J. Sprunk
Mr. Harry W. Wheeler

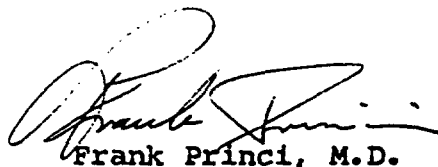
FROM: Frank Princi, M.D.

DATE: February 28, 1961

The enclosed statements represent tentative drafts of what I consider to be company medical policy and medical department policy. They are submitted to you prior to our meeting for your careful review, comments and suggestions. On the morning of March 8th we shall review both these documents with the expectation that we can come to agreement concerning various items.

The medical policy of a company should be clearly understood and agreed upon by everyone in the medical department before it is presented to the management for their consideration. Therefore, I hope you will not hesitate to make any changes that you deem necessary or useful, and will be prepared to discuss these changes at the time of our meeting.

Although there are many other items on the agenda, these will be presented at the time of the meeting and I do not feel it would be useful to review them in advance.


Frank Princi, M.D.

FP:rms

cc: W. R. Perdue, Jr.

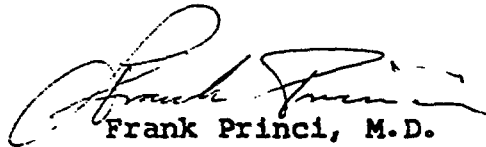
MEMORANDUM

TO: Dr. Roy C. A. Bock
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Mr. Harry W. Wheeler

FROM: Frank Princi, M.D.

DATE: March 7, 1961

The meeting scheduled for March 8 and 9 has been postponed until March 23 and 24. Reservations have been made at the Terrace Hilton for all the out-of-town men. The same agenda will apply except that we shall meet at The Cincinnati Club, 8th and Race Streets. The place of the meeting will be posted on the Club bulletin board under my name.


Frank Princi, M.D.

FP:rms

cc: W. R. Perdue, Jr.

ETHYL MEDICAL DEPARTMENT MEETING

March 8 and 9, 1961

Mediterranean Room - Vernon Manor Hotel, Cincinnati

A G E N D A

Wednesday, March 8

- 9 AM - 12:30 PM - Discussion of medical policy including both administrative and professional aspects.
- 12:30 - 2:00 PM - Lunch
- 2:00 - 5:00 PM - Medical Department Organization - *Titles?*
Channels of Communication - Responsibilities
- 7:30 PM - Dinner meeting - Beverly Hills

Thursday, March 9

- 9:00 - 10:00 AM - Toxicology - Experimental - Clinical
- 10 AM - 12:30 PM - Medical Records
- 12:30 - 2:00 PM - Lunch
- 2:00 - 3:30 PM - Activity Reports - quarterly and annual
- 3:30 - 5:00 PM - Miscellaneous

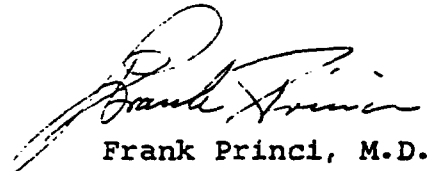
MEMORANDUM

TO: Dr. Emil C. Beyer
Dr. B. B. Blackmon
Dr. Roy C. A. Bock
✓ Dr. J. Gordon Burdick
Dr. Alvin Davis
Dr. Earl W. Doty
Dr. Walter J. Gillogley
Dr. Lester W. Sanders
Dr. Leslie J. Schradin
Dr. Carl J. Sprunk
Dr. D. R. Warren
Mr. Harry W. Wheeler

FROM: Frank Princi, M.D.

DATE: March 9, 1961

The Industrial Medical Association will meet this year in Los Angeles during the week of April 9. It would be advantageous to Ethyl Corporation if there were a good representation of its medical department at these sessions. In the expectation that you will all be able to attend, a meeting of our major medical supervisors and consultants will be held on Tuesday afternoon, April 11th. A complete agenda and the exact time and place of our meeting will be sent to you in the near future.


Frank Princi, M.D.

FP:rms

cc: W. R. Perdue, Jr.

~~Objectives of Ethyl Corp~~
Tentative *OK*
Medical Department Policy

activities
1. The ~~medical~~ program of Ethyl Corporation's Medical Department is ~~established~~ *are based* upon well-defined principles of Preventive Medicine. It is the ~~responsibility~~ *objectives* of this department to prevent disease and injury, both occupational and non-occupational, whenever possible. Its major functions, therefore, are diagnosis and prevention of ~~disease~~ *illness*.

2. Physicians and nurses in industrial medicine have a dual responsibility, one directly to the company and the other directly to the employee. In order that these responsibilities may be discharged effectively, professional personnel must act at all times as impartial medical advisors. Decisions must be reached at all times after appraisal of all the facts without prejudice. The company should always be ready and eager to accept its full measure of responsibility for any claims of personal injury or illness that arise out of employment. It should resist with equal vigor any unjustified claims.

3. Physician-physician relationships are important ~~to~~ ~~any industrial medical department~~ and it should be understood that the role of the medical department in keeping the employee in the best possible health is complementary to that of the private physician. One is not a substitute for the other and both are striving for the same objective. It is essential,

therefore, that they should communicate freely with one another.

Because of this basic principle, the medical department should ^{be made} ~~make~~ available ^{to the private physician} ~~freely~~ to the private physician any medical ^{information} ~~information~~ that may aid in the management of personal illness. He should also be willing to offer such assistance and services as he may be able to render in an ethical manner. In this fashion, the industrial physician can keep himself informed of the employee's progress during the course of non-occupational diseases. These practices not only improve patient-physician relationships but also let the employee know that the company is genuinely interested in his welfare.

4. The medical department ^{will} ~~should~~ always be available for advice in health education. It ^{will} ~~should~~ always conduct itself in accordance with the best medical tradition and be alert to improving medical techniques. Laboratory examinations ^{will} ~~should~~ not be done on a routine basis but should be ordered when indicated by the medical examination.

5. Standing orders for nurses ^{will} ~~should~~ be in writing and signed by the Plant Medical Director. These orders will specify which procedures she may carry out and the conditions under which she may exercise her own judgment.

E-00197

6. Certain immunization procedures are important in the prevention of illness in the working environment. These will be carried out by the Medical Department. Those procedures that concern the general health of the individual or specific

health immunizations are the prerogative of the family physician. When the question of special immunization procedures that are of public health importance arise, the plant physician will conduct himself in accordance with accepted medical procedure, company medical policy and the attitudes of the local medical profession.

7. In ~~all~~ professional procedures and relationships, ~~all~~ company physicians will be guided by Medical Department policy and the principles of the Council on Industrial Health of the American Medical Association.

8. Nothing in this policy shall be construed as limiting or altering the proper professional conduct of any of its physicians.

Tentative Medical Policy

1. Ethyl Corporation recognizes the importance of the health of its employees not only as a matter of general public policy but also because each employee is one of the Company's greatest assets. It also recognizes that good health is of importance to the employee himself and to his family so that they may continue to maintain adequate earning power and to avoid the cost of excessive illness. Therefore, it is the general policy of this Corporation to promote good health and to prevent illness by all proper means and to provide a clean and healthful environment. In addition, it is the policy of Ethyl Corporation to provide toxicological and medical consultation concerning its products.

2. To implement this general policy, the Corporation has provided a complete medical department with all necessary ancillary services and supervision to eliminate safety and hygienic hazards.

3. Medical facilities have been provided at all installations for the purpose of promoting good health and preventing illness. The various divisions are staffed by persons who are not only expert in the practice of medicine but who also understand industrial processes and are able to recognize any possibility of health hazards before serious problems develop.

4. The objectives of the medical department are the maintenance of health, the prevention of disease or injury and the emergency treatment of any medical illness or injury that may arise during working hours.

5. Health maintenance is carried out by routine pre-employment and periodic medical examinations. The former are designed to provide proper placement of prospective employees in order that they will not be likely to produce injury to themselves or their fellow workers. Periodic examinations are designed to provide constant health surveillance of employees so that illness may be detected in its earliest stages when the employee may be guided to competent medical attention at a time when his private physician can be of greatest service. Certain periodic examinations will be required of all employees upon whose health the safety of others is dependent and for those exposed to occupational hazards.

4 6. Emergency treatment or advice will be provided for any acute medical condition that arises during working hours. Continuing observation of any work-connected illness or injury will also be furnished. The medical department will not give treatment or medical management for non-occupational diseases or injury but will make available to the family physician, upon request, any medical information concerning the patient that company physicians may possess.

7. The primary obligation of all medical department physicians is for the health and safety of the employees. Medical information given during the course of professional consultation will remain confidential within medical channels unless the employee requests its release. For the overall benefit of all employees, however, management shall be entitled to complete information concerning industrial accidents or illnesses or diseases that constitute public health hazards. All pertinent medical data shall be made available to management in the event of claim negotiations or litigation concerning a specific injury or illness, except that the extent of any such disclosure may be limited at the discretion of the Medical Director.

Ethyl Corporation Medical Department

I. Historically, for many years, we have been involved in the study of the toxicity of organic lead compounds.

A. The investigation of the action of lead on the body began in the Department of Physiology of the College of Medicine at the University of Cincinnati in 1925.

B. The Kettering Laboratory, where the Medical Department of the Ethyl Corporation has always been housed, was opened in 1930. Since that time, the Laboratory has concerned itself primarily with the effects of lead on man.

1. The Laboratory also concerns itself with all phases of environmental health; beryllium, vanadium, high-energy fuels, carcinogenesis, as well as all practical aspects of industrial hygiene.
2. The Laboratory has a large chemical laboratory in which many varied analyses are done, including approximately 10,000 analyses for lead per year, usually related to human exposure.
3. There is an exposure chamber in which two subjects have and are being exposed an atmosphere contaminated with lead. A total lead balance is being carried out on these two human subjects.
4. Because of a continuing and expanding demand for the laboratory services, a new addition to the Laboratory has been started and will be completed in the fall of 1963.

II. Since the Medical Department was formed, its prime concern has been the toxicity and hazards of tetraethyllead.

A. About forty years ago when the manufacturing of this product began, thirteen deaths soon occurred which could be attributed to this chemical. Since that time there has been no question but that this product is toxic.

B. Based on early investigations, procedures were set up for safe handling and since that time, there has been a continued effort to improve the safety procedures.

1. When unforeseen incidents occurred that resulted in poisoning, intensive study lead to corrective measures; most cases occurred sporadically under certain conditions that have since been corrected
2. Since those early days of development, manufacturing, and exploitation of this compound, there have been only 88 cases of tetraethyllead poisoning in the United States and Canada.
3. In general, these safety procedures have been carefully followed.
4. There has probably never been a poisonous product, which in relation to the toxicity and total volume produced and used annually, that has a better record than TEL with respect to the rarity of illnesses associated with handling and distribution.
5. There is little doubt that the procedures have been successful in promoting safe handling.
6. The work involving tetraethyllead can now be done with a minimum risk to the workmen in manufacturing plants and in the petroleum companies.

There is really no risk in handling it for years or a decade. The danger is in the way it is handled.

"It is axiomatic in industry, that any chemical can be manufactured and used safely with the proper knowledge, no matter how toxic the chemical."

III. I will discuss the hazardous jobs involving the handling of tetraethyllead, in the order of their hazard, discussing the most hazardous first.

A. Tank cleaning and repairing

E-00203

1. Though tank cleaning has produced most of the cases of poisoning, there is no question but what it can be done safely if safety procedures are carefully followed. *It will be done*

B...Manufacturing

1. It has been amply demonstrated that this compound can be produced safely.
2. The real danger occurs when manufacturing is attempted without the proper know-how.

C. Handling of tetraethyllead at refineries

1. The hazard occurs when the product is transferred from the shipping to the storage tanks or during the blending into the gasoline.
2. The equipment involved in these operations has been so perfected and the safety procedure so carefully outlined that no illnesses have occurred among 15,000 workers who have been engaged in these operations, some who have been working up to 30 years.
3. When these workers have been studied for the lead content in their urine (which is a measure of their exposure), it is apparent that they have essentially had no exposure. It can then be said that their job is essentially non-hazardous.

IV. When tetraethyllead is mixed with gasoline in the concentrations generally used, it is not a hazard to man.

- A. The standard concentration established in the United States in 1925 of 3cc./U. S. gallon was based on commercial practice at that time rather than on hygienic considerations.
- B. The Surgeon General of the Public Health Service approved in 1934 a concentration of 4.5 cc./gallon solely for aviation gasoline.
- C. In 1959, the Surgeon General approved the raising of the concentration of TEL in gasoline to 4 cc./gallon. His decision was based on the following:

E-00204

1. At 4 cc. there were no observed adverse effects on engines.
2. The studies that were done on auto exhausts revealed that the

1 lead content did not change appreciably by going from 3 to 4 cc./gallon. It also appeared that the change would not influence smog formation.

D. It was felt that this increase in TEL concentration would not increase the hazards involved in the manufacture and distribution of leaded gasoline.

E. This change would not significantly increase the hazard to public health.

V. TML (tetramethyllead) is an effective antiknock compound with certain desirable characteristics. This product has about the same toxicity as TEL.

A. Sufficient data has been accumulated such that the Public Health Service could state the increasing the concentration of TML from 2.06 cc./gallon to 2.74 cc./gallon would not increase the hazard to industry or to the public.

B. It is also felt that any mixture of these related compounds can be used up to a concentration of 4.23 grams of lead per gallon.

EXHIBIT 10 (LW) 6/11/55
VI. Considerable effort has been expended studying the contribution of auto exhaust to atmospheric pollution.

A. There has been an overall decrease in the concentration of lead in the atmosphere.

B. Alkyl lead can be detected on heavily traveled streets. Such positive findings are inconstant and represent only 1-5% of the total lead in the atmosphere.

C. Though the lead-in-air has not altered appreciably, in Los Angeles county where there is a large number of autos, there has been a continuing upward trend of carbon monoxide, hydrocarbons, nitrogen dioxide, but no change in sulfur dioxide. These trends have been attributed to the autos. City Council 4/4 A 12/1/55

E-00205

VII. The function of the Medical Department of the Ethyl Corporation in -----

is to provide the best possible medical surveillance for Ethyl's customers such that those refinery workers who are exposed to organic lead compounds will not be adversely effected by their exposure. A local physician will be selected as the Ethyl medical consultant.

- A. The latest information regarding the toxic action and effects of the organic lead compounds (as well as the other Ethyl products) will be provided to the local medical consultant. Information will also be provided concerning the treatment of poisoning cases.
- B. The local technical sales representative will coordinate his activities with those of the medical consultant.
- C. Representatives of the Medical Department will visit the refinery as necessary to provide adequate medical service.

1. "Ethyl's" -

"Ethyl's" is a trademark brand organic lead compounds may be obtained individually to determine their state of good health and to ensure that no accidental exposure may occur through use of products.

Memorandum dated December 7, 1944.

GEORGE W. GIBSON

REPORT OF MINUTES OF ETHYL CORPORATION
MEDICAL DEPARTMENT ON MARCH 8 and 9

1941

Present at meeting:

Dr. Roy C. A. Bock
Dr. J. Gordan Burdick
Dr. Alvin Davis
Dr. Frank Princi
Dr. Lester W. Sanders
Dr. Leslie J. Schradin
Dr. Carl J. Sprunk
Mr. Harry W. Wheeler

A tentative medical policy for Ethyl Corporation was defined and discussed. This policy presents the company's purpose in maintaining a Medical Department and describes the overall fashion by which general policy would be maintained and implemented. This policy is consistent with the various policies published by other major corporations in the United States and was acceptable to all those present as a policy that could be carried out realistically. It has been referred to management for their consideration and possible acceptance. A copy of this policy is enclosed with these minutes.

Although the Corporation's medical policy may define and distinguish its point of view toward industrial health, the professional activities of the Medical Department are not described therein. For this reason it is desirable that a professional policy be adopted that is consistent with properly conducted industrial health activities. This becomes the policy of the Medical Department itself and is entitled "Professional Policy." A copy of this policy is enclosed with these minutes. It was discussed at our meeting and modifications were made in the original draft so that this policy would be acceptable and workable for all those concerned.

It was agreed that a free flow of communication is essential for proper control of industrial hygiene hazards and for adequate understanding of all medical problems. In order that proper communication may be established and that all professional persons may be kept informed concerning the toxicity or hazard of any substance with which they are presently or will be concerned a Materials Manual will be issued. This manual will contain all the information that is available concerning each compound with relation to its experimental

and clinical toxicology. As better information is developed, this manual will be kept up to date. In the meantime, when any special problem occurs or any question arises, information will be provided directly by the central medical department upon request from any installation. In turn, any new knowledge developed at the various plants will be transmitted to the central medical department both for evaluation and for further transmittal to other persons who might be concerned. Special continuing clinical investigations will be carried out with all new compounds so that useful data on clinical applications may be developed and made part of our total fund of knowledge.

In order to implement the above, our medical record systems are being re-examined from the point of view of making them as useful as possible. In general, there are two important aspects to medical records. The first is the medical log of the individual and the second is the log of the medical department. In the individual medical record the first thing to be recorded is the examination and then the personal experiences of the worker. An additional type of record is the disability record.

There may be a reason for changing some of these records but not all of them. One reason, of course, is because there may be interchange of personnel between plants, and the second is that in some areas there have been no records. This is particularly true in the examination of field men and other types of field examinations of persons not connected with any central area. All record systems will be re-examined and final recommendations will be made at a later date.

In addition, every installation has a large area of experiences in human toxicology. This may require a special form of recordkeeping since most of the materials with which we are concerned are neurotoxic agents. Consequently, such things as behavior changes might be desirable for continued observation.

One of the considerations in keeping records is the comparison of data from year to year. We must decide what purpose a record is designed to serve and if we do or do not need a system that provides a periodic review of complaints. At the present time it appears that Dr. Rock's medical examination form approach the ideal. This form could, however, be extended to include easier coding and any modification of this record would probably be for the

purposes of coding only. It was suggested that it might be useful if laboratory records were also set up on a codable basis and perhaps to allow provision for additional types of examination.

In order that an annual report may be submitted to the Corporation concerning the Medical Department's activities, it is desirable that all installations report annually to the Medical Director giving a resume of the year's activities. These reports should be in summary form and should include the following information.

- The time spent in pre-employment examinations and the number done.
- The number of periodic examinations.
- The number of special examinations.
- Time spent in counselling.
- The number of treatments given.
- Consultations with private physicians.
- Time spent in plant meetings.
- Special problems or incidents that occur during the year.
- The results of any special investigations.
- A summary of all medical control procedures.
- Scientific papers written or addresses given.
- Future plans both long and short range.

We hope to design a uniform method of reporting so that a comparative estimate of costs may be obtained. This will be discussed further at the April meeting.

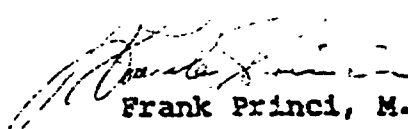
In order to improve communications and reduce the amount of paper that is being transmitted at the present time, quarterly reports will be submitted that will define modifications of procedures, summaries of periodic examinations without reference to special blood or urine lead levels, important incidents or activities during the quarter, and special studies of new products.

Immediate reports will be made to the Medical Director either by telephone or in writing (depending upon the seriousness of the situation) concerning certain serious accidents, injuries or illnesses. The manner in which the report is made will be dependent upon the individual judgment of the person reporting and the urgency of the problem. Regardless of cause, all deaths will be reported immediately and all important hospitalizations. Any item that may be of general interest to others will also be reported as it occurs.

It is apparent that with us as with many other organizations we do not lack communications but we have seemed to lack a definition of purpose and direction. This meeting was devoted to discussions of these problems. The central medical department will endeavor to keep all physicians informed concerning any important events within the Corporation or in the field of industrial medicine in general. Important policy changes in the medical department and any cases of illness that may be of general interest in the field of industrial health will be transmitted to all members of the department for their information.

There was a brief discussion concerning new industrial processes and activities that would be put into operation from time to time at the various plants. It is desirable that any change in process or any plans for new activities be reviewed by the Industrial Hygiene Division prior to going in to operation. This activity will implement our policy of foreseeing problems before they become acute.

Future meetings of Ethyl Corporation's Medical Department will be held on an annual basis. These meetings may occur during the annual sessions of the American Academy of Occupational Medicine or the Industrial Medical Association or may be held at various company locations in rotation. This item will be the subject of our next meeting and future deliberations will be planned for areas and times when they will be most useful to everyone concerned and of greatest benefit to the Corporation.



Frank Princi, M.D.
4-6-61

FP:rms

ETHYL CORPORATION MEDICAL DEPARTMENT
MINUTES OF ANNUAL MEETING
JONATHAN CLUB, LOS ANGELES, CALIFORNIA

April 11, 1961

The primary purpose of this meeting was to bring together the members of the Medical Department in order to explain medical policy and objectives. This department is a service organization whose principal objectives are to maintain health, prevent illness and injury and provide to management proper medical and scientific advice concerning all health problems.

The Corporation's Tentative Medical Policy was discussed and it was explained that this policy was the specific prerogative of management and was subject to modification and approval by the Corporation. It was, essentially, the Corporation's explanation of its own point of view and attitudes toward health problems that might affect the organization, either directly or indirectly.

The professional policy of the Medical Department was also discussed and explained. This policy defines departmental activities and professional responsibilities. No modifications of this policy were suggested.

The need for periodic medical department reports was explained and their composition defined. The character and outline of these reports was explained and their ultimate purpose was discussed. It was apparent that these reports would contain both administrative and professional items. For this reason, it is essential that copies of these reports be sent to the proper administrative officer - in most instances the plant manager. E-00211

The policy for field medical examinations is being reviewed critically

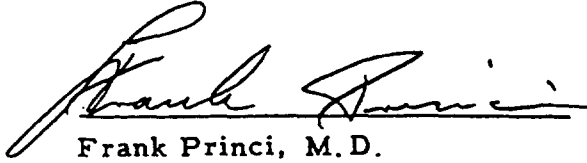
and will be defined at the appropriate time. In the meantime, field examinations will be conducted as they have been in the past.

Dr. Bock and Mr. Wheeler described the environmental, clinical and laboratory observations of TML operators. Although this was a preliminary report, it established the fact that TML was being produced without hazard and that continued periodic observations suggested that no untoward physiologic effects would occur among the workers. This type of study is invaluable from the point of view of plant hygiene and for the purpose of establishing a clear perspective concerning the true hazards of the chemical. Later in the year, and at the proper time, Dr. Bock and Mr. Wheeler will write a consolidated report that will compare environmental concentrations, lead excretion and clinical observations. It was emphasized that there is an area of intra-plant medical observation that lends itself rather readily to scientific observation. Controlled studies of this type will aid materially in defining a number of chemical hazards. For this reason, all plant physicians were requested to consider the possibility of undertaking routine clinical and laboratory studies that might be adaptable for scientific reporting. This policy is consistent with similar activities throughout the chemical industry. The central medical department will assist in the design and pursuit of all studies of this type, upon request. The data from such investigations will be released only as confidential reports and would be published only with the final approval of management.

Time did not permit the discussion of medical forms. However, this is a long range project and requires considerable thought and mutual consultation. A number of different types of medical forms were distributed for future study and consideration. A copy of a review of medical records by Dr. Davis is

3.

included with these minutes.

A handwritten signature in cursive script, appearing to read "Frank Princi", written over a horizontal line.

Frank Princi, M.D.
Medical Director

ETHYL CORPORATION

MEDICAL DEPARTMENT

EDEN AND BETHESDA AVENUES

CINCINNATI 19, OHIO

MEDICAL DIRECTOR

May 10, 1961

Dr. Gordon Burdick
Ethyl Corporation
Box 472
Pasadena, Texas

Dear Gordon:

First, permit me to congratulate you on your election to the presidency of the Texas Industrial Medical Association. It is always a pleasure to see members of our staff actively engaged in outside medical affairs.

I am also delighted to learn of your program for senior student nurses. I most certainly agree that an article describing this program would be valuable not only to the corporation but also to the field of industrial nursing. May I urge you to consider seriously writing this article.

As far as the question on Teflon is concerned, Dr. Sanders has answered it rather adequately in my absence and I do not feel you need any further comment from me.

Yours sincerely,



Frank Princi, M.D.

FP:rms

E-00214

Information copy to Mr. Perdue

TO: Dr. R. C. A. Bock
✓ Dr. J. G. Burdick
Dr. C. J. Sprunk
Mr. H. W. Wheeler

FROM: Frank Princi, M.D.

DATE: August 10, 1962

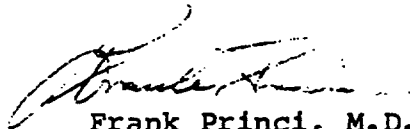
Although our annual medical meeting is designed for the purpose of discussing mutual problems and medical policies, I feel that it is too large in numbers and too brief in terms of time for effective discussion. I am eager, particularly, to determine whether or not our medical policies are cohesive, uniform and effective. In addition, with a department such as ours, it is important for us at the central medical office to know whether or not we are doing too much, too little or assisting you ineffectively. On the other hand, I am equally certain that you wish to have closer contact and liaison with us in order that collectively we may perform our services in a better fashion.

These questions are obviously all matters of policy and I feel that they can be resolved best by mutual discussion. For this reason, I am planning a two-day meeting in Cincinnati on September 18th and 19th. If this date is inconvenient for any of you, it can be changed readily. However, if I hear no dissenting voices by August 27th, I shall assume the dates meet with your approval.

If you wish that hotel reservations be made by us, please notify my secretary and advise her of your mode of travel and time of arrival.

Enclosed is a copy of the tentative agenda. Please suggest any additions or modifications, including particularly any subjects you would like to have discussed.

FP:rms


Frank Princi, M.D.

cc: R. T. P. deTreville
S. I. Lerner
L. W. Sanders
L. J. Schradin

E-00215

21

WORLD WHO'S WHO
IN SCIENCE

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FROM ANTIQUITY TO THE PRESENT

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E-00216

KEENAN, Philip Childs, Am. astronomer; b. Bellevue, Pa., Mar. 31, 1908; s. Charles G. and Evelyn (Childs) K.; B.S., U. Ariz., 1929, M.S., 1930; Ph.D., U. Chgo., 1932, Instr., Yerkes Obs., U. Chgo., 1936-42; physicist Bur. Ordnance, Navy Dept., 1942-46; faculty Ohio State U., Columbus, also Ohio Wesleyan U., Delaware, 1935-36, 46—, asso. prof. astronomy, 1948-56, prof., 1956—, Mem. Am., Royal astron. socs. Author: (with W. W. Morgan, E. Kellman) *An Atlas of Stellar Spectra*, 1942; also numerous articles. Research in stellar spectral classification. Home: 5303 N. High St., Columbus, O. 43214. Office: Perkins Obs., Delaware, O. 43015.

KEENEY, Arthur Hall, Am. ophthalmologist; b. Louisville, Jan. 20, 1920; s. Arthur Hale and Eugenia (Hall) K.; B.S., Coll. William and Mary, 1941; M.D., U. Louisville, 1944; M.Sc., U. Pa., 1952, D.Sc., 1955; m. Virginia Alice Tripp, Dec. 27, 1942; children—Steven Harris, Lee Douglas, Martha Blackledge. Resident surgeon Wille Eye Hosp., Phila., 1949-51; dir. ophthalmic research, instr. to asso. prof. ophthalmology U. Louisville Sch. Medicine, 1951-65; area cons. ophthalmology to VA, 1954—; ophthalmologist-in-chief Wille Eye Hosp. and Research Inst., Phila., 1965—. Recipient Bedell award, 1951; Zentmayer award, 1951. Fellow Am. Ophthalmology Soc.; mem. Soc. Optal. de Columbia, Am. Acad. Ophthalmology and Otolaryngology, A.M.A., Am. Assn. Automotive Medicine (pres.). Author: *Chronology of Ophthalmic Development*, 1951; *Lens Material in the Prevention of Eye Injuries*, 1957. Contrb. numerous articles to med. journals on capillary mechanisms in glaucoma; macular disease; strabismus; dyslexia; Newcastle virus disease; safety lens materials. Home: 8320 Seminole Ave., Phila. 19118. Office: 1601 Spring Garden St., Phila. 19130.

KEEPEN, Vladimir Petrovich, see Köppen, Vladimir Peter.

KEEPIN, George Robert, Jr., Am. physicist; b. Oak Park, Ill., Dec. 5, 1923; s. George Robert and Erlene (Bennett) K.; Ph.B., U. Chgo., 1945; B.S., Mass. Inst. Tech., 1946, M.S., 1947; Ph.D., Northwestern U., 1949; m. Madge Mary Twomey, June 13, 1948; children—Robert, William, Ardis, Mavis, Denise. Postdoctoral fellow AEC, U. Cal. at Berkeley, 1949-50; physics staff U. Minn., 1950-52; research physicist Los Alamos Sci. Lab., 1952—, group leader pulsed neutron research, 1966—. Staff officer Internat. Atomic Energy Agency confs.; cons., mem. cons. profs. orgs. Fellow Am. Phys. Soc., Am. Nuclear Soc.; mem. Fedn. Am. Scis., Sigma Xi. Author: *Physics of Nuclear Kinetics*, 1965; also chpts. other books, articles in prof. journals. Developed technique for measurement of neutron energy spectra; delayed neutron and reactor physics research; inventor techniques for internat. nuclear safeguards, inspection and surveillance of fissile materials. Home: 155 Tunny St. Office: Los Alamos Sci. Lab., Los Alamos 87544.

KEESOM, Willem Hendrik, Dutch physicist; b. Texel Island, 1876; became prof. U. Leyden (Netherlands), 1923. Produced solid helium, 1926; measurements on expansion coefficients of solid bodies at very low temperatures; specific melting and evaporation heat of hydrogen and helium.

KEETON, William Tinsley, Am. zoologist; b. Roanoke, Va., Feb. 3, 1933; s. William Ivis and Doris (Tinsley) K.; A.B., U. Chgo., 1952, S.B., 1954; M.S., Va. Poly. Inst., 1956; Ph.D., Cornell U., 1958; m. Barbara Sue Orcutt, Aug. 9, 1958; children—Lynn Sue, Nancy Lee. Instr., Radford Coll., 1956; Schuler-Gage fellow Cornell U., 1956-58, faculty, 1958—, asso. prof. biology, 1964—, Cons., N.Y. State Edn. Dept., 1961—, Fellow A.A.A.S. (Council 1963—); mem. Soc. for Study Evolution, Soc. for Systematic Zoology, Am. Entomol. Soc., Am. Soc. Zoologists, Animal Behavior Soc., Phi Kappa Phi, Sigma Xi, Gamma Alpha (nat. recorder 1960—). Author: *A Taxonomic Study of the Milliped Family Soriobolidae*, 1960; *Biological Science*, 1967; also articles. Research in evolutionary biology with particular emphasis on roles geographic and behavioral isolation in process speciation of animals, evolution of behavior, homing behavior. Home: 3 Snyder Heights, Ithaca, N.Y. 14850.

KEFFER, Frederic, Am. physicist, educator; b. Anacosta, Mont., May 23, 1919; s. Robert and Placie (Munter) K.; B.S., Wash. State U., 1943; Ph.D., U. Cal. at Berkeley, 1952; m. Lora Maria Sanders, Apr. 24, 1949; children—Thomas, Leslie. Faculty physics U. Pitts., 1952—, prof., 1959—, dept. chmn., 1963—; vis. prof. physics U. Cal. at Berkeley, 1959-60. Cons. Westinghouse Research Labs., 1952-55, Bell Telephone Labs., summer 1961. Mem. A.A.A.S., Am. Phys. Soc. Contrb. articles on theory of ferromagnetism, antiferromagnetism, magnetic resonance, spin waves, double refraction, superexchange, dipolar interactions, magnetic anisotropy to prof. pubs. Home: 235 Woodside Rd., Pitts. 15221.

KEGEL, Otto H., mathematician; b. Bethlehem, Pa., July 20, 1934; s. Friedrich Otto and Margarete (Winkelman) K.; Ph.D., U. Frankfurt/Main (Germany), 1961; m. Waltraut Wallner, Apr. 6, 1961; 1 dau., Hannah. Vis. asst. prof. U. Chgo., 1963-64; decant U. Frankfurt/Main, 1966—. Mem. Am., German, French, London math. socs. Contrb. articles in field to tech.

journals. Address: 40 Alt-Roedelheim, Frankfurt/Main, West Germany.

KEGELES, Gerson, Am. chemist; b. New Haven, Apr. 23, 1917; Alex and Jennie (Wildner) K.; B.S. in Chemistry, Yale, 1937, Ph.D., 1940, postgrad. 1940-41; postgrad. U. Wis., 1945-47; m. Bertha Webber, Apr. 16, 1944; children—Winifred, Lawrence, Stanley, Gloria, Joyce. Research phys. chemist Nat. Cancer Inst., 1947-51; mem. faculty Clark U., 1951—, prof. chemistry, 1956—, chmn. dept., 1960-63; cons. to industry, 1954—. Mem. Am. Acad. Arts and Scis., A.A.A.S., Am. Assn. U. Profs., Am. Chem. Soc., Am. Soc. Biol. Chemists, Biophys. Soc., Washington Acad. Scis. Research and pubs. primarily on optical methods to facilitate the study of biol. materials, especially protein molecules. Home: 14 Tahanto Rd., Worcester, Mass. 01602.

KEHL, William Louis, Am. physicist; b. Canton, O., Apr. 14, 1915; s. Herman E. and Lela (Shepherd) K.; A.B., Washington and Jefferson Coll., 1938; M.S., State U. Ia., 1941; postgrad. U. Pitts.; m. Marie E. Clark, Nov. 28, 1942; children—Dennis W., Lorraine E. With Gulf Research & Devel. Co., Pitts., 1941—, sr. research physicist, 1962—. Mem. Am. Crystallographic Assn. (sec. 1964—), Am. Phys. Soc., Pitts. Diffraction Soc., Am. Soc. for Testing Materials. Research, pubs. on phase behavior inorganic mixed oxide systems, structural and catalytic properties mixed oxides and solid solutions metals; developed improved oil well casing perforator, improved catalysts for petroleum processing. Home: 1942 Fox Chapel Rd., Pitts. 15238. Office: P.O. Drawer 2038, Pitts. 15230.

KEHOE, Robert Arthur, Am. physician; b. Georgetown, O., Nov. 18, 1893; s. Jeremiah W. and Jessie (Jones) K.; student Ohio State U., 1914-15; B.S., U. Cin., 1918, M.D., 1920; m. Lucile Marshall, June 11, 1920; 1 dau., Kathleen. Pathologist, Jewish Hosp., Cin., 1920-24; faculty U. Cin. Coll. Medicine, 1921-49, research prof., 1939-49, prof. occupational medicine, dir. Inst. Indus. Health, 1948-65, dir. dept. preventive medicine and indus. health, 1948-65, prof. emeritus occupational medicine, 1964—; dir. Kettering Lab., 1930-65. Med. dir. Ethyl Corp., 1925-58; nat. cons. USAF Surgeon Gen. U. Cin. Grad. Sch. Arts and Scis. fellow, 1937—. Recipient Knudsen award, 1948-49; Tech. and Sci. Soc. Council Clin. award, 1952; Pub. Health Fedn. Clin. award, 1963. Fellow A.M.A. (vice chmn. council on indus. health 1949—), Am. Pub. Health Assn. (governing council 1955—), Am. Acad. Occupational Medicine (pres. 1949, award 1957); mem. Royal Soc. Health, Indus. Med. Assn., A.A.A.S., Am. Physiol. Soc., Am. Indus. Hygiene Assn., Am. Chem. Soc., Air Pollution Control Assn. Am. (Mellon award 1960), Sigma Xi, others. Research, numerous pubs. field occupational health, toxicity of indus. products, solvents, metals, organic compounds, behavior of certain mineral elements, trace metals, especially lead and fluorides. Home: 345 Resor Av., Cin. 45220. Office: Kettering Lab. U. Cin. Coll. Medicine, Eden Av., Cin. 45219.

KEHR, August Ernest, Am. geneticist; b. Frankfort, Ky., Mar. 2, 1914; s. Carl Adolf and Anna Esther (Heiler) K.; B.S., Cornell U., 1936, M.S., 1947, Ph.D., 1950; m. Mary Louise Coon, Dec. 26, 1942; 1 dau., Janet Marie. Tch. scl. and agr., Unadilla, N.Y., 1936-42, Hudson, N.Y., 1942-47; research asst. plant breeding Cornell U., 1947-50; asso. prof. horticulture La. State U., 1950-54; with Dept. Agr., also prof. horticulture Ia. State U., 1954-58; asst. br. chief, vegetables and ornamental research, br. Dept. Agr., Beltsville, Md., 1958-65, br. chief, 1965—. Mem. fellowships evaluation cons. NSF, 1957-59. Mem. Am. Genetics Assn. (pres. 1964—), Soc. Study Growth and Devel., Am. Potato Assn., Am. Hort. Sci., Sigma Xi, Phi Kappa Phi, Gamma Sigma Delta. Contrb. articles prof. journals, chpts. in books. Home: 10202 Green Forest Dr., Silver Spring, Md. 20903. Office: Plant Industry Station, Beltsville, Md. 20705.

KEHR, William Ralph, Am. agronomist; b. Blue Earth, Minn., July 1, 1921; s. John J. and Mary G. (Reimjes) K.; B.S., U. Minn., 1943, Ph.D., 1949; M.S., Kan. State U., 1947; m. Marie C. Sterner, June 22, 1946; children—Mary A., James W., Donald R. Plant breeder Cal. Packing Corp., Rochelle, Ill., 1949-53; research agronomist crops research div. Agr. Research Service, U. S. Dept. Agr., prof. agronomy U. Neb., Lincoln, 1953—, Fellow Am. Soc. Agronomy (dir.), A.A.A.S.; mem. Crop Sci. Soc. Am. (dir.), Am. Dehydrators Assn. (research council), Sigma Xi, Alpha Zeta, Gamma Sigma Delta. Research, numerous pubs. in genetics and improvement of alfalfa and grain crops, breeding methods, insect and disease resistance, quantitative inheritance, chem. composition, genetics and cytogenetics of self- and cross-fertility, mgmt. systems of alfalfa. Home: 1410 N. 37th St., Lincoln, Neb. 68503.

KEIDEL, Wolf-Ottilie, German physiologist; b. Geimshelm, Dec. 14, 1917; s. Georg and Fanny (Dotterweich) K.; M.D.; m. Ursula Ludwig, Sept. 4, 1943; children—Dorothea, Ingrid, Matthias. Dir. Physiol. Inst., U. Erlangen/Nuremberg, 1961—, also full prof. physiology, Mem. German Physiol. Soc. (1st sec.), N.Y. Acad. Scis., Ordil-Ibro-Paris Coll. Author: *Kybernetik in Einzeldarstellungen*; *Vibrationsrezeption*;

Physiologie des N.S. von Standpunkt der Regelung s. lehrre. Coeditor: *Kybernetik (mag.)*, Zeitschrift für experimentelle Medizin. Research on electrophysiology of sense organs, cybernetics, physiology of central nervous system. Home: am Meilwald 23. Office: Physiol. Institut, University of Erlangen/Nuremberg Universitätstrasse 17, Erlangen, Germany.

KEIL, Karl Louis, German meteorologist; b. Westphal-Elberfeld, Germany, Nov. 7, 1898; s. Karl Guido and Wilhelmine (Schmidt) K.; Ph.D., U. Gießen; m. Ilse Köppen, Dec. 3, 1926; children—Egonhard, Karl, Otto, Assn., collaborating scientist Prussian Obs., Lindenberg; with Prussian Meteorol. Inst., Berlin; govt. counselor Reichsamt für Wetterdienst, Berlin; cons. German Meteorol. Service, head library and information sects., Bad Kissingen; dir. climate atmospheric sect. German Central Office Meteorology, Offenbach. Mem. German Meteorology Soc., German Soc. Geophysics. Author: *Handwörterbuch der Meteorologie*, 1950, also articles. Editor: *Meteorol. Rundschau*, Springer-Verlag, Heidelberg. Address: Schopenhauerstrasse 24, 605 Offenbach/M., Germany.

KEIL, Werner, German zoologist, ornithologist; b. Gießen-Lahn, June 5, 1925; s. Karl and Wilhelmine (Link) K.; Ph.D., Justus-Liebig U., Gießen/Lahn; m. Erika Schmitt, Feb. 16, 1952; 1 child, Jutta. Assn., Obs. Applied Ornithology, Hessia, Rhenania, Pfalz, Sarre., 1952-63 dir., 1964—. First pres. Ornithol. Observing Sta. Untermain, Frankfurt. Recipient Silver medal Union Def. of Ornithology. Mem. German Soc. Ornithologists. Author: *Ernährungsbiologie von Singvögeln*; *Steigerung der siedlungsbedingten von Vögel*; *Abwehr von Vogelschäden in der Forst- und Landwirtschaft*; *Untersuchungen zum Einsatz von Vögel im Rahmen der biologischen Schädlingsbekämpfung*. Research on applied ornithology. Address: Steinacker Strasse 44, Frankfurt/Main, Germany.

KEILHOTZ, Gerald W., Am. chemist; b. West Chester, Pa., Aug. 7, 1912; s. Watson M. and Bessie (Westcott) K.; B.A., Lincoln U., M.A., U. Utah; Ph.D., Ore. State U.; m. Barbara J. Jackson, June 1948; children—Candace, Carol, Michelle. Instr., Ore. State U., 1941-42; research chemist Gen. Chem. Co., 1942-44, Sylvania Electric Co., 1944-48; instr. U. Tenn., 1948-52; with Oak Ridge Nat. Lab., 1948—, reactor chemistry div., 1958—. Mem. Am. Chem. Soc., Am. Nuclear Soc., Sci. Research Soc. Am. Research, pubs. In micro analysis, microwave spectroscopy, isotopic analysis, radiation damage, effects of radiation on corrosion of structural materials by molten fluorides, high temperature measurements, fission product release, transport and deposition. Home: 7121 Cheshire Dr., Knoxville, Tenn. 37919. Office: P.O. Box X, Ridge 37830.

KEILIN, David, biologist; b. Moscow, USSR, Mar. 21, 1887; M.A., Magdalene Coll., Cambridge; prof. biology Cambridge U., 1931-52, also dir. Metzn. Inst. Fellow Royal Soc. (Copley medal 1951), French Acad. Scis. (asso. fgn.). Research on biochemistry of higher Diptera; demonstrated existence of cyclocurins (pigment found in some yeast and bacteria cells). Office: Meltone Inst., Cambridge, Eng.

KEILL, James, physician; b. Scotland, Mar. 27, 1873; M.D., Cambridge, Eng.; began practice medicine, Northampton, Eng., 1903. Fellow Royal Soc., 1911. Author: *The Anatomy of the Human Body*, 1958; *An Account of Animal Secretion, the Quantity of Blood in the Human Body, and Muscular Motion*, 1768. Sponsoresd. mech. or intra-mech. sch. medicine; applied math. calculus to physiology; estimated quantity of blood in human body, blood flow, and force of heart. Died July 16, 1719.

KEILL, John, Brit. mathematician; b. Edinburgh, Scotland, Dec. 1, 1671; incorporated M.A., Balliol Coll., Oxford, Eng., 1694, D.M., Oxford, 1713; M.A., Edinburgh U.; m. Mary Clements; 1 son. Became lect. exptl. philosophy Hart Hall, Oxford, 1700, Savilian prof. geometry, 1713; tress. of Palatines, 1709-11; decipherer to Queen Anne, 1712-13. Mem. Comm. for Longitude. Fellow Royal Soc., 1700. Author: *Introductio ad veram physicam*, 1701; *On the Laws of Attraction*, 1708; *On the Newtonian Solution of Kepler's Problem*, 1708; *Euclidis elementorum libri*, 1717; *Introductio ad veram astronomiam*, 1718. Defended Newton's claim as inventor of differential calculus in answer to Leibnitz, 1705; application of Huygen's theorems of centrifugal force to explain figures of earth; studied cohesion and elasticity; urged revival of study of Euclid, 1717. Died Oxford, Aug. 31, 1721.

KEIM, Christopher Peter, Am. physicist; b. Tecumseh, Neb., Apr. 6, 1906; s. Jacob Henry and Mary (Pohlman) K.; A.B., Neb. Wesleyan U., 1927, Sc.D., 1959; M.S., U. Neb., 1932, Ph.D., 1940; m. Lucille Parli, June 25, 1929; children—Virginia Ann (Mrs. Clark Hayes), Robert Christopher. Engr., Lincoln Tel. & Tel. Co. (Neb.), 1923-31; prof. phys. scis. Yale (Neb.) Coll., 1933-37; research fellow U. Neb., 1937-40; mem. chemistry faculty Tulsa U., 1940-41; research engr. Sylvania Electric Products Corp., Salem, Mass., 1941-42; research fellow Mellon Inst., Pitts., 1942-44; sr. physicist Tenn. Eastman Corp., Oak Ridge, 1944-47, Union Carbide Corp., 1947; dir. stable isotope research and prodn. div. Oak Ridge Nat. Lab., 1947-57, dir. tech. information div., 1957—; dir. Mgmt. Services, Inc. Recipient Alumni Achievement