

Staff Meeting Bulletin  
Hospitals of the » » »  
University of Minnesota

Irregular Shedding  
of the Endometrium

STAFF MEETING BULLETIN  
HOSPITALS OF THE . . .  
UNIVERSITY OF MINNESOTA

Volume XI

Friday, January 19, 1940

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Published for the General Staff Meeting each week  
during the school year, October to May, inclusive.

Financed by the Citizens Aid Society

William A. O'Brien, M.D.

I. LAST WEEKDate: January 12, 1940Place: Recreation Room  
Powell HallTime: 12:15 to 1:20 p.m.Program: Movie: "How to Watch a  
Football Game"Treatment of the Undescended  
Testis; With Reference to  
End Results

Charles E. Rea

## Discussion

Owen H. Wangenstein

Bernard A. Watson

Leo T. Samuels

John L. McKelvey

Present: 152Gertrude Gunn  
Record Librarian

- - - -

II. MOVIETitle: "Anesthesia"

Released by: M-G-M

- - - -

III. ANNOUNCEMENTS

1. WELCOME - Members of the Continuation Course in Hospital Administration at the Center for Continuation Study who are our guests today. Many are attending this staff meeting for the second and third time. Some have been kind enough to tell us that they enjoy coming to these meetings and receiving the bulletin. We, in turn, assure them of our sincere pleasure in their interest in us.

2. WANTED - Physician trained in general laboratory practice in a small army laboratory. Staff consists of one chemist, one registered medical technologist, and four to six student helpers. Clerical assistance and other aid. Applicant must be less than 30 years of age; experience is desirable.

3. CLIFFORD P. FITCH - Professor and chief of the division of veterinary medi-

cine died Thursday, January 11, after a short illness (coronary occlusion). Dr. Fitch was a regular attendant at these meetings whenever anything of joint interest to human and veterinary medicine was discussed. His vigorous personality could be felt as well as heard. No one ever had to wonder where he stood on issues. To his friends, he was a tower of strength and assistance. In our neighborhood he was always in the foreground in anything which would benefit all of us. He took an active part in civic and religious community affairs and was probably one of the best known members of the agricultural group. He served in both state and national organizations and was national president of his organization two years ago. A few years ago an excellent medical technologist in this organization was suffering from that old adage, "I do not know whether it is true or not, but it is worth while repeating." Practically everything that happened in the laboratory (unfavorable) was always laid at her doorstep. Dr. Fitch called one day to inquire if we knew of a good medical technologist. The plight of our young lady was explained to him, and he immediately became interested in her case. His subsequent observation verified our impression that her work was satisfactory. Today she is married and is raising a family. Dr. Fitch's interest in seeing that justice was done to this young woman is only one example of his many-sided character. The day before he died he visited everyone in his organization as if he had a premonition that he should put his house in order. More than 1,000 of his friends attempted to attend his funeral. We have suffered a loss in the untimely departure of a good friend and fellow worker.

4. WEDDING -

Donald Wilson de Carle  
and Betty Morrow Cordingly - married  
on Thursday, December 7, 1939 at San  
Francisco.

-- Congratulations!

- - - -

5. CENTER FOR CONTINUATION STUDY

## DIETETICS PROGRAM

Monday, January 29

8:30 - 9:00	Orientation . . . . .	.Mr. Nolte, Dr. O'Brien
9:00 - 10:00	Normal Diet . . . . .	Miss Thomas
10:00 - 11:00	The Vitamin Question . . . . .	.Dr. Koehne
11:00 - 12:00	Sodium and Potassium in the Diet . . . . .	.Dr. MacKay
1:30 - 3:30	Demonstration - University of Minnesota Hospitals	
	Liver and Gall Bladder Disease . . . . .	
	. . . . .	Dr. C. J. Watson, Miss E. Pearson
	Gastrointestinal Diseases . . . . .	Dr. Layne, Miss Mannick
	Postoperative Feeding . . . . .	.Dr. Rea, Miss V. Pearson
4:30 - 6:00	Treatment of Diabetes . . . . .	.Dr. B. A. Watson
7:30 - 9:00	Symposium - Education	
	Nurses . . . . .	Miss McCuish
	Medical Students . . . . .	Miss Netz
	College Students . . . . .	Miss Ryan
	Patients . . . . .	Miss Foley

Tuesday, January 30

9:00 - 10:00	Dental Caries . . . . .	.Dr. Koehne
10:00 - 11:00	Diets in the Treatment of Nephritis . . . . .	.Dr. MacKay
11:00 - 12:00	Vitamin B Deficiency Disease . . . . .	Dr. Brown
1:30 - 5:00	Demonstration - College of Agriculture, Forestry, and Home Economics	
	Training of Dietitians . . . . .	Miss Biester
	Purchasing Textiles and Clothing . . . . .	Miss Phelps
	Cafeteria and Dining Room Service . . . . .	Miss Dunning
	Student Health Service . . . . .	Dr. Boynton
7:30 - 9:00	Symposium - Nutrition	
	Technology . . . . .	.Dr. Bailey
	Education . . . . .	Miss Hobart
	Social Welfare . . . . .	To be announced

Friday, January 31

9:00 - 10:00	Diets in the Treatment of the Allergic Child . . . . .	.Dr. Stoesser
10:00 - 11:00	Obesity and Undernutrition . . . . .	.Dr. MacKay
11:00 - 12:00	Dietary Factors in Anemia . . . . .	Dr. Boehrer
1:30 - 3:30	Demonstration - Hospital Food Service	
	Clen Lake Sanatorium . . . . .	Miss Townsend
	Midway Hospital . . . . .	Miss Hara
	Northwestern Hospital . . . . .	Miss Juhnke
4:30 - 6:00	Round Table - Administrative Problems . . . . .	.Mr. Fisk
7:30	Dinner - Minnesota Dietetic Association	
	Address - Nutrition, A Phase of Modern Preventive Medicine . . . . .	Dr. Koehne

5. CENTER FOR CONTINUATION STUDY (Cont.)PROBLEMS OF NEWBORN AND PREMATURE INFANTS  
PROGRAMThursday, February 8

- 9:00 - 9:30 Orientation - Mr. Nolte, Dr. O'Brien  
 9:30 - 10:00 Morbidity and Mortality Problems of Newborn and Premature  
 Infants - Drs. Hartley and Wilson  
 10:00 - 11:00 Causes of Death at Necropsy - Dr. Potter  
 11:00 - 12:00 Special Features of Physical Examination and Diseases of  
 Newborn Infants - Dr. Stewart  
 1:30 - 3:30 Demonstration - Care of Premature Infant, Minneapolis  
 General Hospital - Dr. Stoesser and Miss Carlsrud  
 4:30 - 6:00 Skeletal System - Dr. Lipschultz  
 Diseases of Skin and Congenital Syphilis - Dr. Michelson  
 7:30 - 9:00 Symposium - Asphyxia  
 Causes - Dr. Anderson  
 Pathology - Dr. Potter  
 Physiology - Dr. Boothby  
 Treatment - Dr. Huenekens

Friday, February 9

- 9:00 - 10:00 Respiratory System - Dr. Huenekens  
 10:00 - 11:00 Circulatory System - Dr. Dwan  
 11:00 - 12:00 Upper Digestive System - Dr. Leven  
 1:30 - 3:30 Demonstration - Minneapolis General Hospital  
 Breast Feeding - Dr. Richdorf  
 Contagious Diseases - Dr. Platou  
 4:30 - 6:00 Lower Gastrointestinal System - Dr. Wyatt  
 Genitourinary System - Dr. Kennedy  
 7:30 - 9:00 Symposium - Birth Injuries and Anomalies of Nervous System  
 Pathology - Dr. Potter  
 Roentgenology - Dr. Peterson  
 Surgery - Dr. Peyton  
 Pediatrics - Dr. Shannon  
 Psychiatry - Drs. Clark and Jensen

Saturday, February 10

- 9:00 - 12:00 Demonstration - University of Minnesota Hospitals  
 Blood Dyscrasias - Drs. Booth and Hanson  
 Care of Infants Including Artificial Feeding - Dr. Wilder  
 Special Therapy - Dr. Sako  
 2:00 - 4:00 Round Table - Discussion of Problem  
 Obstetrics - Dr. McKelvey  
 Pediatrics - Dr. Helmholz  
 4:30 - 6:00 Summary - Drs. Hartley, Wilson and associates

#### IV. IRREGULAR SHEDDING OF THE ENDOMETRIUM

Rodney F. Sturley

Abnormal uterine bleeding is the most frequent single complaint encountered in gynecology. Such bleeding may be roughly divided into two groups, menorrhagia and metrorrhagia. Metrorrhagia includes all uterine bleeding not related to rhythmic menstrual periods, or occurs only during the normal non-bleeding phase of the cycle. Menorrhagia refers to abnormalities of the menstrual flow, be it prolonged or profuse.

To appreciate the theoretical as well as histological explanations for abnormal uterine bleeding, one should first briefly consider the physiology of the normal menstrual cycle.

The mechanism of menstruation and development of endometrium, based on original work of Hitschmann and Adler in 1908, has been thoroughly worked out by Robert Meyer, Schroeder, and others. These men have shown the correlation between the development of the follicle in the ovary, with the formation of a corpus luteum, and the changes in the endometrium.

Following the period of menstruation, with the casting off of the surface of the endometrium, a period of repair begins. This is followed by a period of proliferation. The changes taking place during this phase of the cycle are under the control of the hormonal influence of the developing follicle. The active hormone is called estrin.

If we consider the first day of the menstrual flow as the first day of the cycle, a brief description of changes can be offered in sequence. The first two days of the cycle is the period of tissue loss with subsequent regression of the endometrium from a highly secretory structure to a non-secretory, non-proliferative one. The third to the fifth day of the cycle is the period of regeneration, during which the epithelium lining the remnants of the glands lying

in the basal portion of the endometrium grows out over the surface. During this period mitotic figures are few; no proliferation is noted; glands are straight, narrow and without function.

From the fifth day until about the thirteenth to seventeenth day of the cycle the endometrium is in an active stage of growth or proliferation, the so-called proliferative phase. This again is under the influence of the follicular hormone, estrin, and only ceases after ovulation, when the corpus luteum effect becomes evident. The proliferative stage is characterized by cellular proliferation of both stroma and glands with a necessary increase in thickness and vascularity of the entire endometrium. The cells of the stroma and glands enlarge, and contain numerous mitotic figures. The nuclei of the glandular epithelium are in direct contact with the base of the cells, and no glycogen granules can be demonstrated. The lumina of the glands are smooth and round. As ovulation approaches, the glands become somewhat wavy but never distinctly tortuous.

Very soon after ovulation occurs the effects of estrin produced by the follicles are augmented by the corpus luteum hormone, progesterone. From this point of the menstrual cycle until menstruation, the changes that occur are preparatory to the implantation of the fertilized ovum. Menstruation results when this does not occur.

The first "progravid" change is the production of clear zones beneath the nuclei of the glandular epithelium. These zones are glycogen droplets and can be demonstrated with specific stains. As time passes these droplets distribute themselves throughout the entire cell. There is a decrease in the number of mitotic figures and instead of an increase in the number of cells, there is an increase in size. The size of the glandular epithelial cells increases faster than the stroma. As a result the glands become tortuous with many pseudo-ingrowths into the lumina. As the cells discharge their secretion, a frayed appearance develops along the sur-

face of the lumina. The tortuosity develops to a higher extent in the middle third of the endometrium, allowing a more compact appearance to the more superficial portion. This has led to the terms zona compacta, zona spongiosa and zona basalis. As the cycle approaches menstruation or implantation, the arterioles become more spiral in shape, the stroma cells swollen, the glands even more tortuous and frayed.

If the ovum be not fertilized, the highly developed endometrium is no longer needed. Corpus luteum effect terminates and menstruation begins. This process is preceded by increased edema of the stroma, hemorrhage into the stroma both by rhexis and diapedesis, and round cell infiltration. A small area of endometrium near the surface becomes necrotic and is shed, this is followed by similar processes at various points all along the surface. The deeper portions are next affected until almost the entire zona functionalis has been removed, leaving only the zona basalis, the area that never enters into the functional activity, but serves as the source of epithelium for repair under usual circumstances.

The corpus luteum effect, as evidenced by secretory changes in the endometrium, terminates rapidly. Histological examination of the menstrual endometrium may show evidence of secretion on the first day and occasionally the second. Any prolongation of this finding approaches the particular pathological entity to be discussed here. After the second day of menstruation only regression or regeneration should be present.

It is quite clear, then, that the endometrium as the end organ of ovarian function shows very characteristic changes. These may be interpreted with great accuracy and are so regular that it is possible to describe the condition of the ovary with exactness. Conversely, disturbances of ovarian function will be mirrored with equal exactness in the endometrium and these may be readily interpreted by the trained observer.

The close association of deficient ovarian function with very well known and

characteristic changes in endometrium is demonstrated by the clinical entity, cystic glandular hyperplasia, the so-called swiss cheese endometrium. Here the clinical picture is usually one of metrorrhagia occurring in two age groups, the young girl and the woman approaching the climacteric. Endometrium obtained at curettage yields consistent and satisfactory evidence of abnormal endometrial development, which is an exaggeration of the normal proliferative phase of the cycle and is the result of prolonged follicular activity and an absence of ovulation and corpus luteum formation and effect. As in cystic glandular hyperplasia resulting from prolonged follicular activity, so also prolonged corpus luteum effect may be evident in endometrial specimens. When the corpus luteum effect does not cease as it normally should, there is a prolongation of the cycle without bleeding. The specimen at curettage shows a hypertrophy of the secretory phase. Should, however, the corpus luteum effect be prolonged but with a gradual decrease in strength, then bleeding occurs with the production of characteristic histological findings to be described as irregular shedding. These cases are associated with abnormal uterine bleeding and more specifically menorrhagia.

Prolonged and profuse menstrual bleeding may be associated with certain well known pathological conditions. These include endometrial polyps, endometritis, chronic pelvic congestion, congestive heart disease, submucous myomata, etc. But in the absence of such disturbances a considerable number of patients show prolonged and/or profuse menstruation. A careful study of the endometrium derived from these patients will often show the characteristic morphological lesions which have been described as irregular shedding and irregular regeneration of the endometrium.

The majority of these patients are in the age group where the menopause may soon be expected, although occasionally younger individuals are similarly affected. The usual clinical picture is of gradual prolongation of a previously normal menstruation to periods which may

last as long as two weeks or more. Less frequently the blood loss is not only prolonged, but is also grossly excessive. The menses recur at the normal interval and are accompanied by the usual menstrual moulina. The characteristic histological lesions will vary, depending upon the duration of the bleeding prior to curettage.

In 1914 Driessen described a condition in which there was prolonged and incomplete shedding of the endometrium following the menstrual period. The original description is still acceptable to this day. Here, in contrast to cystic glandular hyperplasia, the primary complaint is prolonged and profuse bleeding at the time of rhythmic menstruation. Pankow, in the same year, described the absence of surface epithelium in cases of prolonged menstrual bleeding. He believed the condition was a disturbance in regeneration of the endometrium following menstruation. Kaufman and Hoeck, working with Robert Meyer, described the histological picture in seven cases, four presenting a history of menorrhagia, one of oligomenorrhea, and two with intermenstrual bleeding. The endometrium in these cases contained collapsed, star-shaped glands containing glycogen and situated in a very dense stroma. In 1928, Baniecki, again working with Robert Meyer, reported sixty-one cases of irregular shedding of the endometrium, excluding all cases past menopause or following abortions. He recognized that a large percentage (33%) were improved with curettage alone. Robert Meyer, in 1930, gave a complete description of irregular shedding and regeneration of the endometrium in the Henke-Lubarsch textbook and states that it is a most frequent cause of menorrhagia.

Traut, in 1935, published the first complete article on this subject in English. Other men have mentioned the condition, none of whom have reported any cases using the same terminology. Jones recognized the fact that abnormal uterine bleeding is associated with secretory phase endometrium, but does not recognize the entity of irregular shedding. He believes the same findings can be found in any menstruating endometrium and that nothing specific can be as-

cribed to those with prolonged bleeding. It is true that similar findings may be found in the menstrual endometrium of a normal cycle one or two days after onset of bleeding, but certainly the presence of these same findings after a patient has been bleeding 8-12 days is not consistent with our conception of the physiology of the menstrual cycle and menstruation.

Hamblen, in 1936, described abnormal endometrial findings in the secretory phase of the cycle associated with menorrhagia. His classification differs from ours and will therefore be omitted.

Wilson and Kurzrok, in 1938, described a mixed endometrium characterized by cystic glands in association with secretory glands or decidual-like stromal cells. The pathogenesis in these cases was believed to be limited to the ovulatory cycle in which there is an overactivity of estrogenic hormone. They were able to reproduce this condition experimentally by the administration of estrogenic hormones during the follicular stage with resulting prolongation of the menstrual bleeding.

Rockstroh, in 1938, completely summarizes the history and findings of irregular shedding and regeneration of the endometrium but offers a difficult suggestion as to the cause. Instead of accepting the usual theory of prolonged corpus luteum effect, he is of the belief that the condition is better explained by the lack of sufficient follicular hormone during the first few days of the menstrual cycle. This conclusion was developed by the shortening of the bleeding period with the administration of estrin. It does not seem justifiable that a conclusion as to etiology should be drawn from this.

The endometrium obtained on curettage in this condition shows morphological changes which are distinctive and which allow a diagnosis of irregular shedding of the endometrium. Fundamentally the endometrium remains in menstrual decomposition with a delay or incomplete shedding of the same. As mentioned before, the shedding of the menstrual endometrium

should be completed in two days with surface epithelium completely regenerated in five days.

A knowledge of the fine histological details is essential to diagnosis. The glands are collapsed. Most of the secretion in the cells has been discharged. The lumina appear star-shaped when cut in cross-section as a result of collapse and shrinkage of the surrounding stroma. The central margin of the glandular epithelium is frayed. The nuclei are discrete and located in the basal portion of the gland cells. When specific stains are used, glycogen droplets can be demonstrated in the cytoplasm. The surface epithelium is missing. There is a marked irregularity in the thickness of the endometrium. The stroma is shrunken and composed of many deeply basophilic spindle-shaped nuclei, with little cytoplasm. There may be an extravasation of blood throughout the stroma. Some specimens show rather prominent infiltration of lymphocytes. At one time these were considered an etiological factor in the production of prolonged bleeding. At the present time the infiltration is considered secondary to the presence of an open wound which has lost its chemical protective mechanism against the upward spread of infection. Many of the arterioles near the surface are dilated and have a thicker wall than is usually present in this area. Many arterioles are thrombosed. Immediately about the thrombosis, necrosis can be found. Degenerated or hyalinized areas are scattered diffusely through the tissue.

In the interpretation of this material it must be borne in mind that these areas of endometrium which show remains of secretion phase changes belong to the previous cycle. While retained for abnormally long periods the vast majority of this tissue is gradually cast off or otherwise removed. The normal mechanism of regeneration is continuing throughout this period and may be expected to have advanced to a degree roughly comparable to the time which has elapsed since bleeding began. Thus the degree of changes described above will vary in relation to the time at which the material is taken.

Treatment in this condition is bound to be deficient in the absence of a known etiology. There is no adequate explanation of the fact that under normal circumstances menstrual endometrium is shed completely and expeditiously. Even in normal menstruation the endometrium at the top of the fundus and cornua tends to be shed later than that of the remainder of the uterus. The mechanism often is not clear. Quantitative hormonal studies have not been entirely satisfactory and further information is necessary.

The possibilities of treatment vary in the different age groups. In both the young and old age groups simple curettage is frequently sufficient to establish normal subsequent menstruation. In the younger age group, follicular hormone has been administered with moderate success both as treatment and prophylaxis against recurrence. In cases with severe bleeding, uncontrolled by curettage or hormone therapy, hysterectomy may occasionally be necessary. Sterilization by x-ray is not advisable before the age of 40 years. In patients approaching the menopause, x-ray sterilization is the procedure of choice where the condition is severe and curettage is not sufficient.

A review of all curettages done in 1939 at the University of Minnesota Hospitals was carried out. The clinical history of the patient was only referred to after a histological diagnosis was made. Occasionally this has altered the first impression, though surprisingly seldom. There were 282 curettages in the series. Fourteen cases had no histological diagnosis since the curettings were insufficient in quantity. Twenty-two different diagnoses were made. The largest group, 71 cases, merely represents material removed during secretory phase of the normal menstrual cycle. These 71 cases were not all unsuccessfully diagnosed as many were merely curettages for such conditions as dysmenorrhea, carcinoma of the cervix, myomata uteri, etc. However, it is true that a large percentage of these cases were patients presenting symptoms of abnormal uterine

bleeding and consequently were discharged without classification and required further observation to establish a diagnosis. The same may be said for the 24 cases yielding proliferative endometrium, which again is not a diagnosis, but a phase of the menstrual cycle.

The largest single group of abnormal specimens was that of cystic glandular hyperplasia. Forty cases, or 14% of the total series presented this entity. Other clinics report approximately the same frequency. Some find a slightly higher incidence, around 20%. In our review, adenocarcinoma of the corpus uteri was found in 27 cases, or 9.5%. This frequency is rather high, primarily the result of concentration of referred material.

Seventeen cases or 6% of the entire curettages for the year presented the characteristic findings described for irregular shedding. Some of these cases presented variations from the typical picture, but these will not be considered in this paper.

It is our belief that a certain number of the endometrial specimens showing normal proliferative and secretory phase endometrium with history of menorrhagia would fall into the irregular shedding group, were these patients curetted after bleeding had started, preferably around the 5th to 7th day. As is often the case, the patient is seen in the dispensary presenting a history of menorrhagia. She may or may not be bleeding at the time. She is then given a date for admission in the near future. By the time the patient is admitted bleeding may have stopped as many as 15 days before. Obviously, normal endometrial specimens are thus obtained.

Observation of the patient at shorter intervals in the clinic, and admitting her when the uterine bleeding has started, will definitely increase the incidence of the diagnosis "irregular shedding." This, then, offers a hope for improvement in the diagnosis and treatment of a most frequent, and many times serious complaint, menorrhagia.

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## V. GOSSIP

We depart for Red Wing, Minnesota's miniature Rome with its many hills. The day is cold, although the sun shines brightly. The official temperature is 18° below. The wind blows the snow in whirling gusts across the road. We are headed for another Alumni Meeting. We stop at the high school and show the football movies to the squirming, noisy children who, believe it or not, are staying after school to see them. My good host Ray Hedin, is taking me to his experimental laboratories in the country. These are located in the laboratory section of the country estate of A. P. Anderson, known far and wide as the inventor of the process by which puffed wheat, puffed rice, and other puffed cereal grains are made. Dr. Anderson is a graduate of the University of Minnesota in one of the classes of the 90's. At the present time he is in Hawaii on his winter vacation. Although we come primarily to see son-in-law Hedin's laboratory, we become intensely interested in Dr. Anderson's place. The main laboratory is located in the rear of his home. Smaller laboratories are in another building adjacent to his home. All the buildings are connected by a series of heated and lighted tunnels similar to our campus arrangement. One is amazed by the size of the experimental apparatus, some of which seems to be at least 50 - 75 feet in length. All of it indicates great care in selection and maintenance. In recent years, new experiments are underway, for now attempts are being made to mimic the effect of air currents similar to cyclones and tornadoes. In one room are a series of cells containing cereal grains from all over the world. In another room a collection of botanical specimens (Dr. Anderson majored in botany and chemistry, obtaining his Ph.D. abroad). The walls of the buildings are more than 18 inches in thickness. So perfect is the insulation that a minimum of heat is required in the winter months. When Dr. Anderson was a young man he saved his money to go to school and earned enough on the side to buy a little home for his father and mother. The day he returned home with his receipted bill for final payment, he saw his humble gift going up in flames. In an adjacent building, the botanical laboratory and the chemistry laboratory are to be found. Dr. Hedin has his operating room for experimental surgery

in this unit. Mrs. Anderson's desk is seen near by as well as that of her husband. Files of indexed scientific journals line the wall. Collections of butterflies, laborously assembled by his wife and children fill rows of cases. A nearby photographic unit with modern equipment is an unexpected pleasure. Curios from Hawaii, including many from the original inhabitants are assembled here. The family microscopes are kept in a separate cabinet. Each member of the family has his own scope and no expense was spared to provide them with the best types. As building after building is visited, one is impressed that this remarkable man must enjoy an unusually full life. Home and laboratory, school and shop, library and play-room, all seem to be arranged in such logically related fashion. In a nearby home on the estate I was introduced for the first time to abstract art. A studio has been made from an old chicken house. Mr. Anderson's son and an associate artist are at work when we arrive. This modern studio consisted of lathes, air-compressors, sanding machines, paint guns and other articles which seemed to be unusual pieces of equipment for a studio. Abstract art, I am informed, will replace conventional art. Conventional art, which is commonly represented by portrait and landscape paintings will be replaced by photography. Abstract art does not deal with subject material but is always presented in three dimensions. It has no relationship to ordinary objects nor should it be confused with other types of artistic expression. The artists are busily engaged, making some low tables of unusual design. In the yard we see a mass of stone and steel which is an outdoor example of abstract art. In one corner of the living room there is an enormous tubular structure painted with different colors and representing something which the artist had in mind. On the wall is a cubical design. Abstract art in the form of music is also demonstrated for me. Although we came to see Ray's laboratory, there was so much else to see that I found myself in a daze. In the evening we had the usual alumni meeting enlivened by secretary's report - "We had a meeting last year." Toward morning the alumni band returned to their warm beds wondering what would be in store for them on the next trip.