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Science Fights Crime

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Science Fights Crime

Poisons have been used for centuries by all tribes and peoples. Not too long ago a papyrus found between the knees of a mummy in the valley of the Nile revealed, when it was translated, that Egyptians in 1552 B. C. knew about poisons and also how to use them. The original information must have come from the trial and error method as indeed the names of many of our poisons would indicate — dog-bane, rat-bane, cow-bane, leopard's-bane. Physostigma, for example (from which we now obtain eserine used as a myotic), was known to African tribes as the ordeal-bean since it was used to determine guilt. If the accused, after taking the drug, survived, he was judged innocent; if he died — guilty. And there is some evidence that the tribal chiefs also knew that while one powdered bean would kill, two or three would act as an emetic so that the accused had a sporting chance to live.

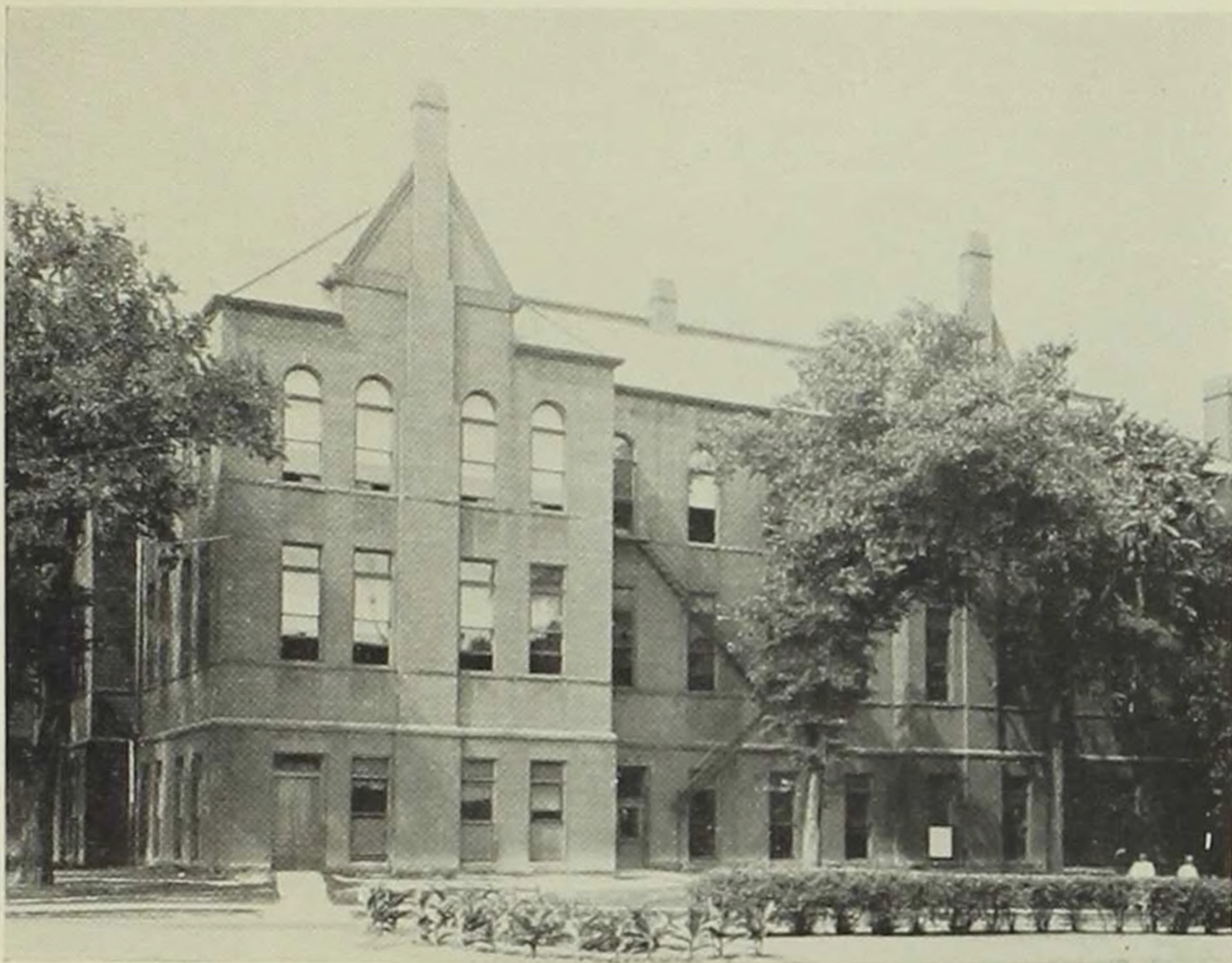
Poisoning may be classified as accidental, suicidal, or homicidal. Whatever the reason behind their use, poisons are interesting and also dangerous enough to merit careful study. It was not until 1836 that chemistry had advanced to a point where certain poisons could be detected by an ex-

amination of the stomach contents. Since the discovery of the Reinsch Test the use of arsenic or mercury by would-be poisoners is no longer common since the poison can be readily discovered.

Toxicology is the science of poisons. It is an exact science, depending on chemical analysis to determine whether or not a poison is present. The toxicologist thus must know chemistry and he should know the physiological action of drugs.

Many people have asked me how I became interested in the science of poisons. It grew out of a hobby. I had been doing toxicology work for the State for several years as the assistant to Dr. Elbert W. Rockwood, the state chemist. Dr. Rockwood continued to teach toxicology after I was transferred to the College of Pharmacy in 1903, but much of the state work was entrusted to me and I have been doing both official and private testing ever since.

All poisons are dangerous but they are not always used for criminal purposes. Many of our poisons are used in very small amounts in medicines. Strychnine, for instance, a poisonous alkaloid that is lethal in doses of $\frac{1}{2}$ grain or less, is widely used as a nerve stimulant in medicinal doses of $\frac{1}{60}$ grain. Because the properties of poisons are not too well known, many of the cases which come to me are from accidental poisoning. In these cases the work of the toxicologist is

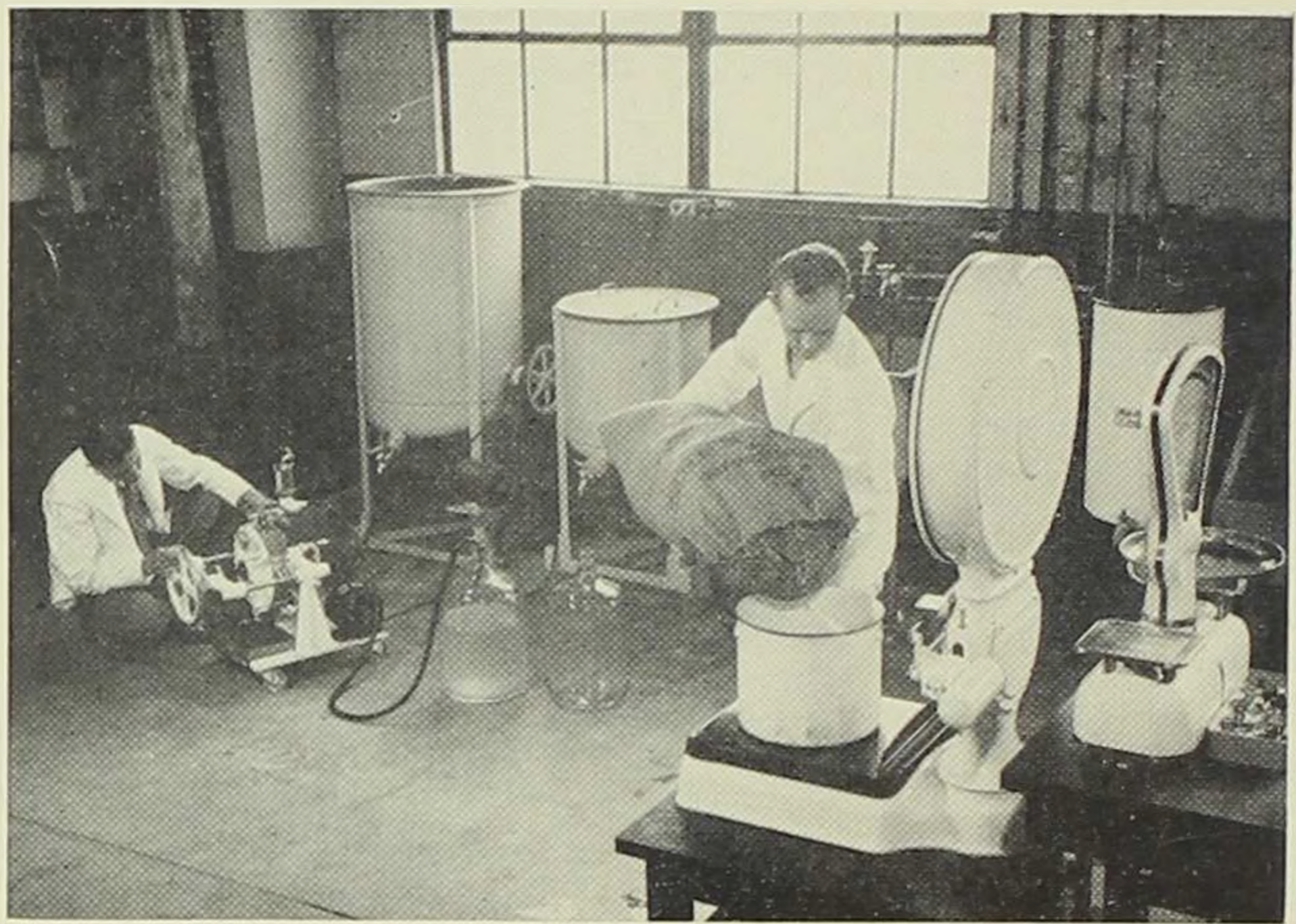


SECOND HOME (THIRD FLOOR) OF THE COLLEGE
OF PHARMACY.

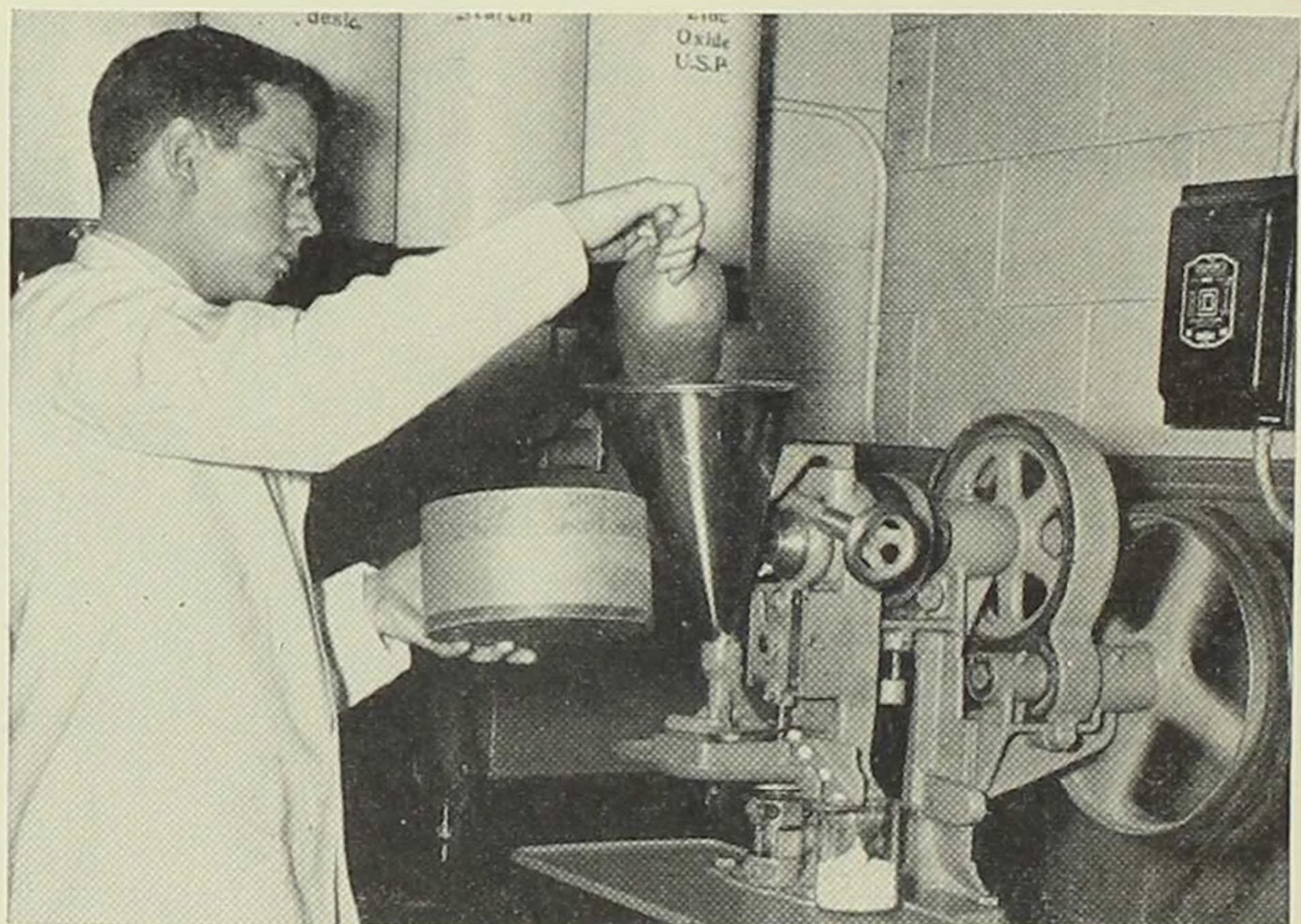


A GROUP OF PHARMACY STUDENTS BEFORE THE THIRD
HOME OF THE COLLEGE OF PHARMACY.

VIEWS IN PHARMACEUTICAL MANUFACTURING LABORATORY

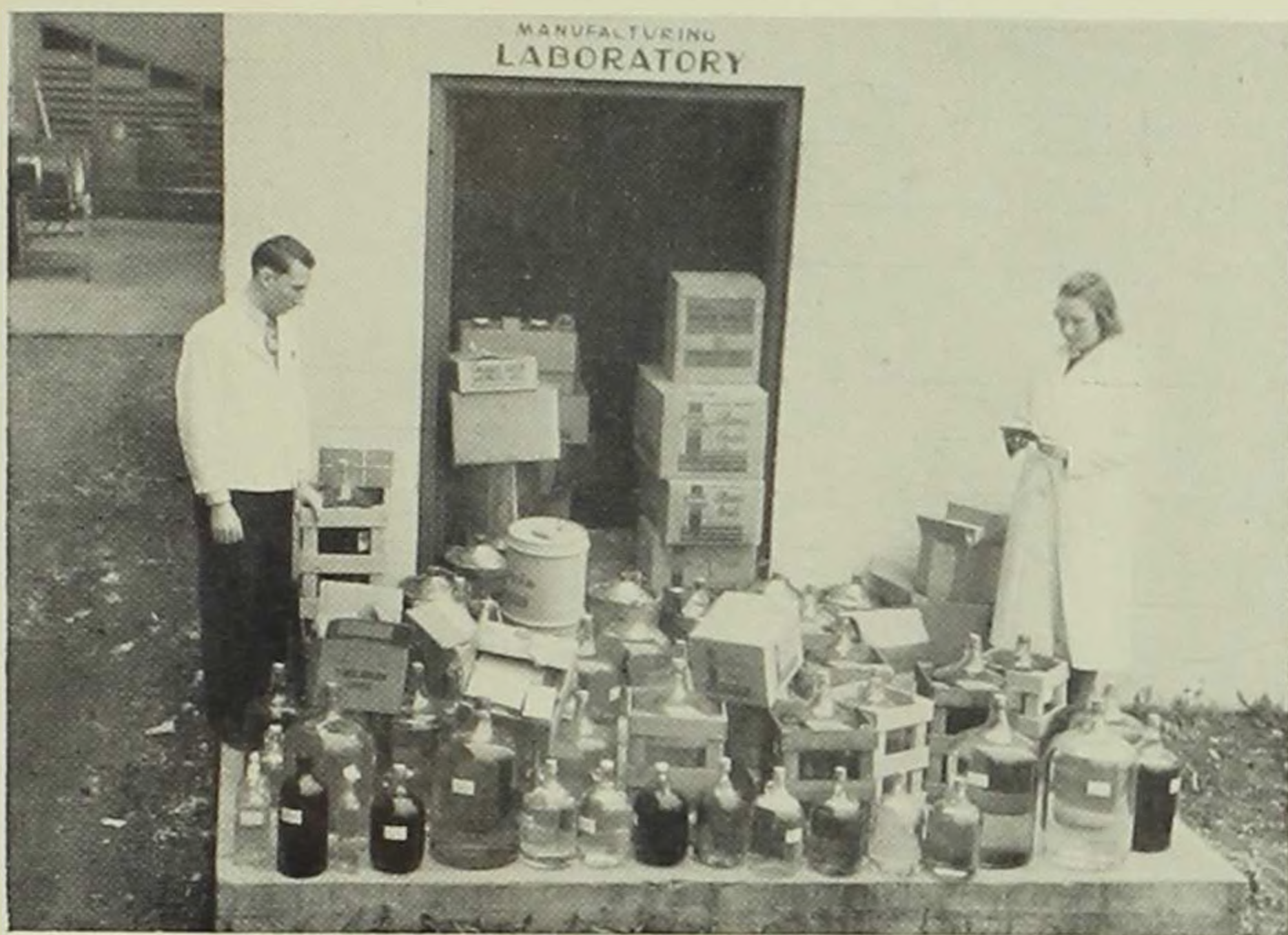


PREPARING CRUDE DRUG FOR FABRICATION INTO MEDICAL PRODUCT.



MAKING 100 TABLETS A MINUTE FOR UNIVERSITY HOSPITAL.

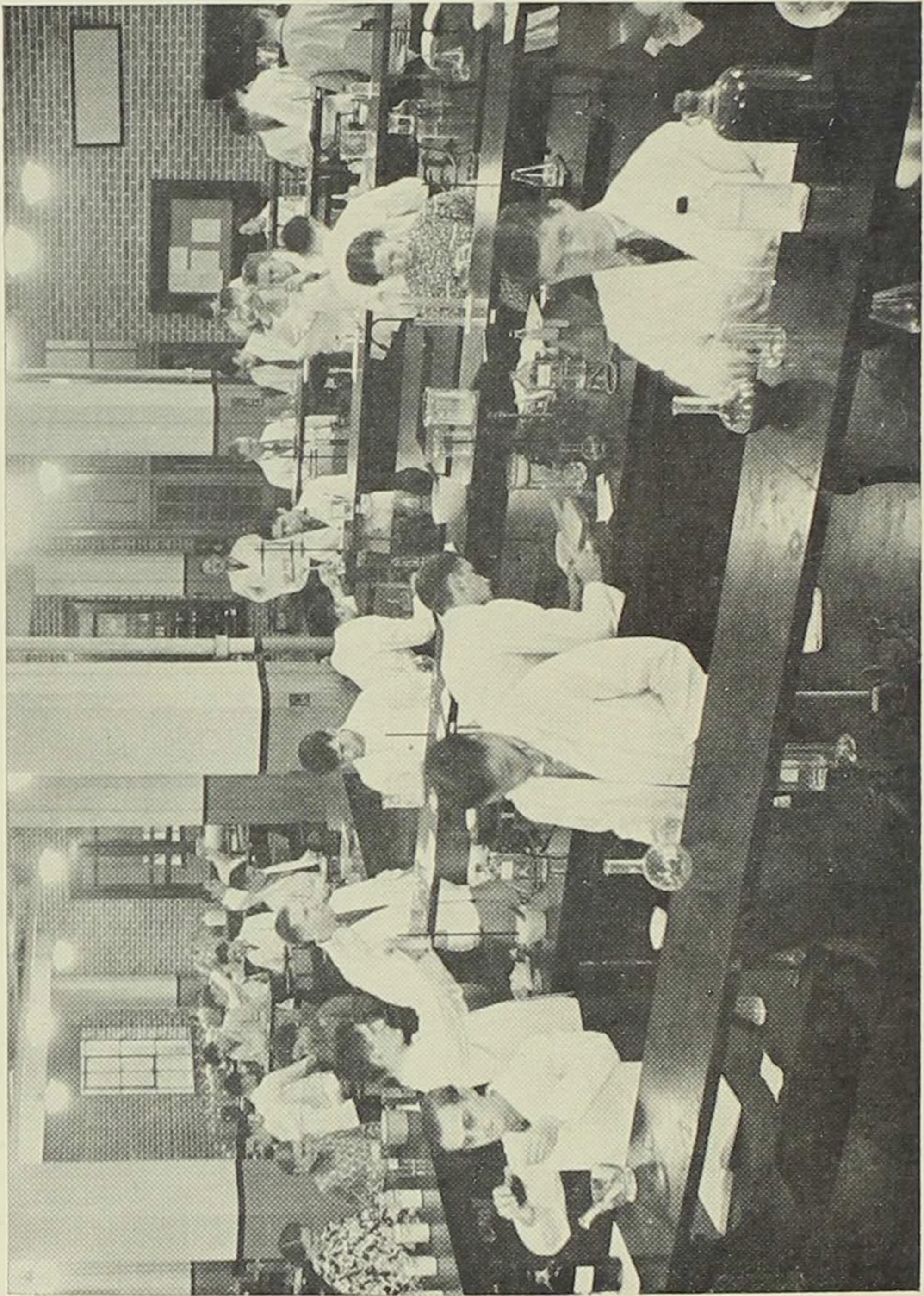
FROM LABORATORY TO UNIVERSITY
HOSPITAL DISPENSARY



TYPICAL DAY'S FABRICATION OF MEDICINAL PRODUCTS
SENT TO UNIVERSITY HOSPITAL.



SENIOR PHARMACY STUDENTS ON DUTY IN UNIVERSITY
HOSPITAL PHARMACY.



SECOND YEAR STUDENTS IN PHARMACEUTICAL LABORATORY.

chiefly preventive. First he detects the poison and eventually he may be responsible for guarding against its indiscriminate use.

Let me give you some examples of accidental poisonings. A lady once brought me a beautiful pink angel food cake which, out of the kindness of her heart, she had baked for a children's birthday party. The children all became very sick, so the lady brought the cake to me. She was very excited. She said she baked the cake herself and she knew it was all right. "Did you eat a piece," I asked her, "and were you sick?" "I'll tell the world I was sick," she replied, but she still thought the cake was all right. It was a beautiful cake, too. "What did you put in it?" I asked, and then we got to the clue. The cream of tartar she had used turned out to be antimony potassium tartrate, a powerful emetic for animals, used by her husband who was a veterinarian. No wonder the children got sick.

Accidental carelessness like this often results in trouble. People save old medicines which decompose and change their properties from harmless to dangerous ingredients. I once had a doctor send me a can of ether for analysis. "I bought another man's practice," he wrote in his letter, "and I found this among the supplies I got. It had been opened and I used it to anesthetize a child. The child died. What's wrong with it?" Ether as soon

as opened to the light begins to decompose into a compound that is a heart depressant. I sent this information to the doctor and never heard from him again.

Occasionally something comes to my attention which leads to a new protective law. For example, when sodium fluoride was first put on the market as an insecticide it was not marked as a poison. It was sold just as one would sell sugar. Then two deaths occurred in Iowa and I identified the poison and reported it. Now there is a law that sodium fluoride must be marked poison and labeled with proper warnings.

On the preventive side, the toxicologist may often stop an accidental death. He may also prevent a criminal death. A policeman came in one day and produced a small vial which is similar to those in which cigars are sometimes sold. He said he wanted the contents, a small amount of powder, analyzed. I asked why. The policeman replied: "I just want to know." "There is more back of it than that," I countered, "and you'll have to tell me its history." He replied that for two or three mornings after he had eaten his breakfast he was sick to his stomach. "This morning," he continued, "my wife went to the kitchen to get something, and I switched coffee cups on her, and she became sick. Then I found this in the kitchen cupboard, and I think we'd better have it examined."

His suspicion was well founded. The vial contained white arsenic which is odorless and tasteless. His wife was killing him painlessly all right, like a painless operation on a dog — cutting off an inch of its tail at a time. At first the irate policeman was going to get a divorce, but then he thought better of it and had his wife examined by a psychiatrist. She is now in an insane asylum.

It is evident from this policeman's story that the history of a case is important to the toxicologist, especially when he is helping to detect a criminal poisoning. In such instances the toxicologist often supplies the technical information which helps to solve a case and since these instances are dramatic and exciting, they are by far the best known part of his work.

Poisons fall into three classifications: (1) irritants like arsenic; (2) nerve stimulants like strychnine; (3) blood poisonings like carbon monoxide. The toxicologist knows the physiological action of all these classes, and it is therefore important that he have a complete history in order to know what kind of poison he is looking for.

A question that is frequently asked a toxicologist is how long after death a poison can be detected. The answer is that if it is organic it will decompose with the body and the limit is probably one year; however, if the poison is metallic it can be found after many years. For this reason our Iowa

law does not permit any corrosive or poisonous metals to be used in embalming fluids. Let me give you an example of how the abuse of this law complicated a case which came to my attention.

A number of years ago a metallic poison was found in a woman's stomach. Since she had been embalmed, I insisted on testing the embalming fluid before reporting and in it found the same metal. The story of the case was that the woman had been sick about a week before her death and the doctor had pronounced it stomach ulcers and put her on what is known as the "sippi" treatment; and she apparently had recovered. One night about midnight the husband reported that his wife had died. The neighbors came in and prepared the body for the funeral. The doctor signed the death certificate, giving the cause of death as intestinal flu, and the woman was buried.

Several months elapsed and the neighborhood talk finally resulted in a legal investigation. This talk grew out of the fact that when the neighbors arrived, on the night of the death, the woman was in bed fully dressed. Her hands were folded on her breast, her hair was combed, and the bed clothes were neatly arranged. They remembered also that they had seen her pumping water the evening before. In addition to this, a young girl who had ridden to the graveyard with the husband had remained as his housekeeper.

The poison used in this case acts in a peculiar way. In toxicology we say it jumps. The poison combines with the albumen of the mucous membrane and breaks the small capillaries; they bleed and form a clot. This condition continues throughout the digestive tract. The clots are pin-head in size and usually two or three inches or more apart. In this case the entire digestive tract was prepared as a court specimen. A competent pathologist testified that the clots found had been produced at least a week before death.

No amount of the chemical introduced in the embalming fluid could have produced the clots, for they had to be formed when there was a beating heart. Evidently a second dose of the poison had been given the night of her death.

It should be noted that the husband did not testify. He had taken out an insurance policy on his wife's life payable to himself. He had signed a poison register, but not with his own name, and at the inquest he refused to write since his penmanship might incriminate him. Added to this, and not to be overlooked, is the young girl who remained as his housekeeper. The jury decided that he was guilty and made him a boarder at Fort Madison for life.

The embalming fluid which complicated solving this case had been manufactured in Cleveland where the manufacturer strenuously denied the use

of any metal. A trip to Cleveland and a call at a miserable little laboratory found the so-called doctor on his vacation. The office girl said that she remembered the correspondence and quite frankly stated that the embalming fluid contained the metal. I called her attention to the fact that the Iowa law prohibited the use of corrosive or poisonous metals in embalming fluids. "Oh yes, we know that," the office girl replied, "but there is no penalty attached." She was right.

It is unfortunate for the toxicologist when a coroner is the undertaker. If he performs the autopsy he may also destroy the evidence. I had two stomachs sent in recently that were embalmed before the autopsy. Embalming fluids contain formaldehyde which is a reducing agent making it impossible to test for some poisons, such as cyanide. These fluids are usually colored with eosin, a persistent dye, and this makes the toxicologist's work doubly hard.

Our laws are written to protect the accused and they go on the theory evidently that it is better to allow some of the guilty to escape justice than to punish one innocent person. The Iowa courts do not hang people on circumstantial evidence but they sometimes give them a life sentence. In poison cases the evidence is naturally circumstantial. Whatever his motives (whether hate, revenge, jealousy, hastening of inheritance, or replacing old

love with new) the poisoner does not take his friends into his confidence; it is a stealthily and deliberately planned crime. To convict him, the state must establish a motive, prove possession of the poison, and if possible show where it was purchased and whether the accused was in a position to administer it.

The above is particularly true of a poison case, especially when the coroner is careless and destroys the evidence. Fortunately the poisoner usually makes some slip that leads to his identity. While this part of the work belongs to the State Bureau of Investigation, the toxicologist is often important. Here are some cases to show how the poisoner may trap himself.

A retired farmer, wishing to replace his old love with a new, decided to put poison in vitamin capsules that his wife was taking. He removed the vitamin powder from four capsules. In two capsules he placed poison. In two capsules he placed ordinary flour. The capsules were then put back in the original container. He could not have known when his wife would take a capsule containing the poison.

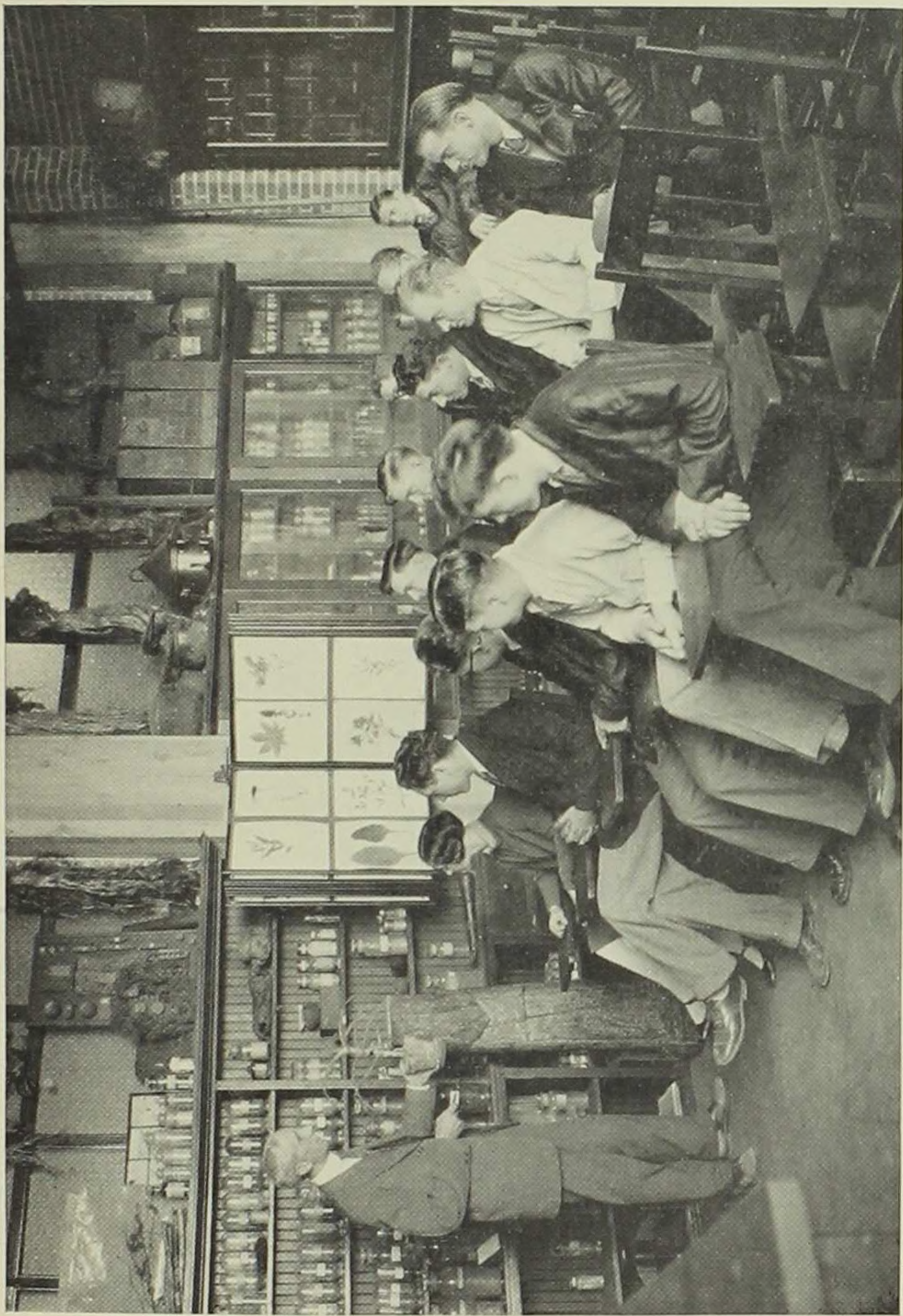
One night, shortly thereafter, the farmer came home and found his wife very sick. She asked for a doctor and told him that the only thing she had taken was a vitamin capsule. She died within an hour and a chemical examination disclosed poison.

Why the extra capsule of poison and why the two capsules of flour has not yet been explained, but this mistake coupled with his love affair led to his conviction. If he had filled only one capsule and bided his time, he might have succeeded.

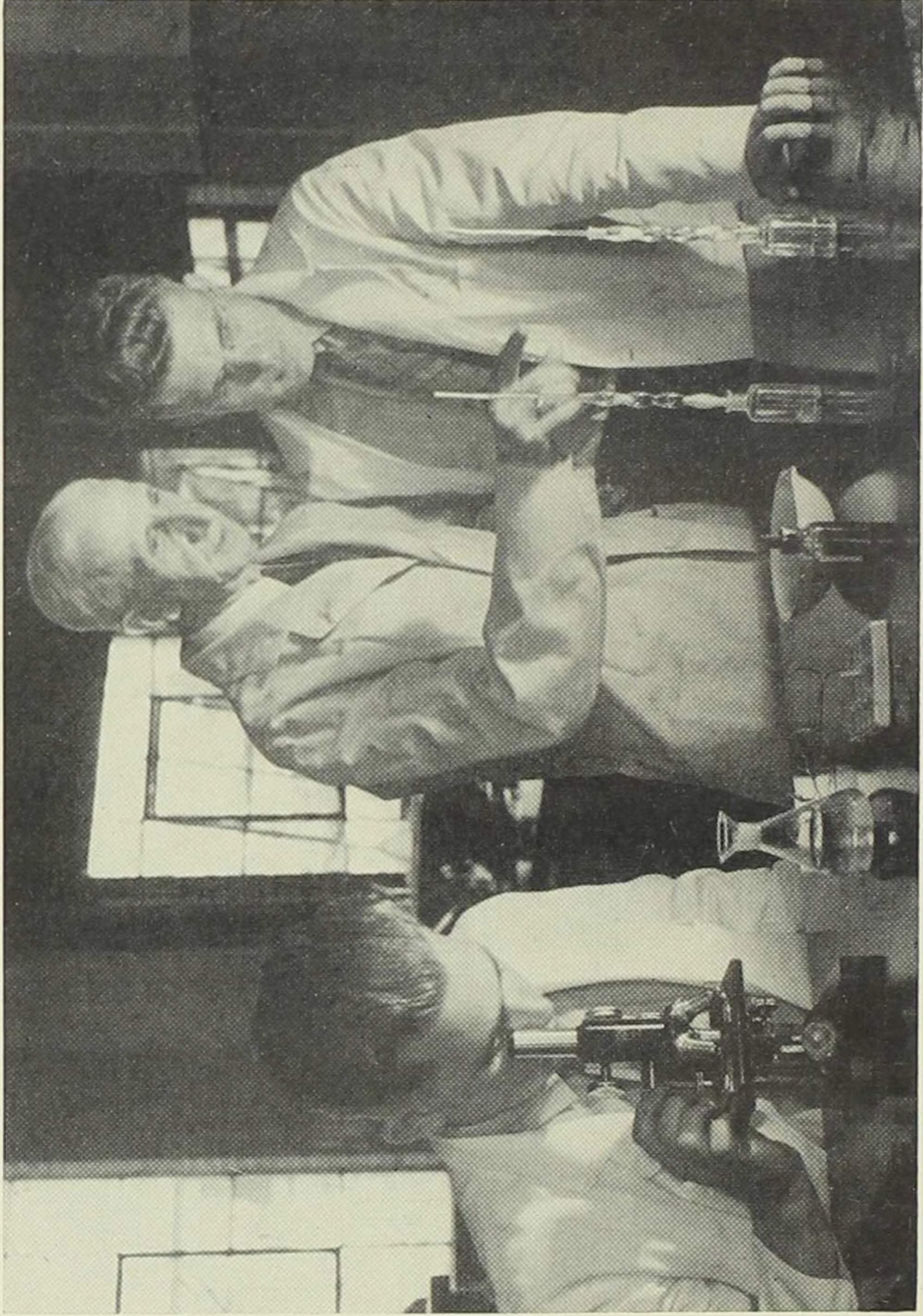
Another case to prove the point — a farmer and his wife were accused of poisoning their only daughter. They had decided to leave the farm and move to a small town. They left in the morning with a load of furniture, but the 12-year-old daughter stayed at home. They returned about 3 P. M. and found the girl dead on the kitchen floor. She was stretched out, clothes neatly arranged, hair combed — hands folded on her breast. They did not touch her but called their preacher.

The minister suggested that they call a doctor who signed the death certificate, "apoplexy." As they were about to lower the casket at the grave an officer halted the proceedings, demanding an autopsy. Poison was found in the stomach. There was a \$5,000 policy on the girl's life and the insurance company had demanded the examination. It was also found that there was a \$5,000 mortgage on the farm. The poison found in the stomach was one of the most terrible known and no person dying from this poison could die a relaxed death with arms folded and clothes all neatly arranged.

Not all poison cases are detected, probably no more than half. When a body is disinterred and a



DEAN TEETERS LECTURING TO A SECTION OF SENIOR STUDENTS IN PHARMACOGNOSY
(1930).



DEAN EMERITUS TEETERS DEMONSTRATING SENSITIVE TEST FOR ARSENIC
IN TOXICOLOGY.

poison is found, someone has made a mistake. It is easy to see how this happens, for some poisons simulate diseases. Irritant poisoning reacts like acute indigestion, appendicitis, peritonitis, etc., while narcotic poisoning simulates epilepsy, apoplexy, uremia, and certain heart and cerebral diseases. In my experience I have found only two lawyers who claimed to know chemistry. One informed me that he had had chemistry and would conduct my cross-examination. This was a small Iowa town and the lawyer evidently had sent out word of this cross-examination for the high school chemistry class was dismissed to be in court.

The rustic attorney began with, "H₂O is water, isn't it?" "HCl is hydrochloric acid? HNO₃ is nitric acid? NaCl is sodium chloride?" and several others. My answer to all these queries was *yes*. Finally he said, "Na₂CO₃ is Baking Soda, isn't it?" The answer was *no*. The lawyer seemed surprised and repeated the question several times with the same reply, *no*. At this stage the judge stated that the witness had permission to explain to the attorney just what Baking Soda is. This was a rare opportunity — to explain in detail that what he was talking about was washing soda and not baking soda. The high school kids enjoyed it; the judge rapped for order. This ended the cross-questioning. That attorney was known thereafter as Baking Soda Joe.

Training will help. The Peace Officers Short Course given for the past fourteen years at the State University of Iowa under the direction of the College of Law has included a course in toxicology. It is hoped that it will develop into a regular university course for the training of Police Officers as a profession. This may help, for example, to overcome the general prejudice against autopsies. Coroners and doctors hesitate to order an autopsy unless there is distinct evidence of foul play. And a death certificate signed angina pectoris, intestinal flu, or heart failure is general enough to cover many suspicious deaths. Furthermore it takes an alert doctor to catch a death from poisoning — especially from an irritant which causes such a common symptom as an upset stomach.

One case where an alert doctor helped solve a crime came to my attention a few years ago. Just after a severe snow a farmer reported the death of his wife. The coroner, who was an older man, did not think that he could make the trip so he sent a young doctor who was temporarily taking care of a practice there. The doctor stated that he found the woman prepared for burial. He asked the husband several questions and was about to sign the death certificate when it occurred to him that people do not die without a cause. He asked for a more detailed report of her death and found that

just before death she had had a convulsion after her husband had given her a quinine capsule, supposedly for a cold.

The doctor refused to sign the death certificate and ordered an autopsy. Poison was found. The doctor told me later that after he made this decision he sweat blood until the positive report was received. He stated that he knew definitely that if the report was negative he was through as a doctor in that community.

To aid in the detection of criminal poisoners, laws have been passed requiring that all poisons must be so labeled and in addition be marked with a skull and cross bones. The law also requires the purchaser of poison to sign a poison register at the drugstore, giving the name of the poison, the amount, what it is to be used for, the date, and the signature of the purchaser. This register is open to inspection by any peace officer.

Some years ago a woman asked a druggist in Iowa City for "Rough on Rats," but she wanted the kind that did not turn their faces black. The druggist dispensed a harmless powder and notified the police. In doing so he prevented a suicide.

There are also unwritten laws which furnish protection. Fortunately, for many years now, newspapers in reporting poison cases have not named the poison. There is an ethical reason for this. The number of poisons that any ordinary

person knows is not great, and simply mentioning one may put an idea into someone's head. When a reporter slips, I am sure to get several articles to be tested for this same poison.

A man sent in a piece of pie with the request that it be tested for poison. He stated that his wife was not in the habit of baking him pie and he thought this should be tested. It was loaded with arsenic. What happened, I do not know.

This is matched by the old gentleman who sent some tobacco to me saying that every time he tried to chew it, it made him sick, and well it might for it contained strychnine. He was persistent to say the least.

A toxicologist's work is never dull. Furthermore, I find that the human interest keeps it from being too depressing. Although it brings me in contact with the sordid side of life, I am always conscious that the people involved represent a very small percentage of humanity. I get comfort, not from the comparatively few that I have helped send to the penitentiary, but from the larger number of troubled souls who are relieved of their fear of being poisoned.

WILBER J. TEETERS