MR. CHIPS TEACHES GEOMETRY

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(*As curtains part, the teacher is seen seated at his desk correcting papers or busying himself in some other professional way. Bell rings. After a short wait, the class makes a natural entrance by twos and threes. They engage in general whispered conversation and gradually become noisy*)

TEACHER. (*Rapping for order*) Let's have it quiet, please. (*Rises and looks the class over carefully*) Are you chewing gum, Fairfield?

FAIRFIELD. Yes sir.

TEACHER. That's why you can't think. You concentrate too much on chewing gum. Throw it in the basket. (*Fairfield goes to metal waste basket and drops a chunk of hard candy with a loud bang*) Did you say that was gum?

FAIRFIELD. Yes sir.

TEACHER. It sounded like a piece of pig iron. (*Class laughs heartily at this and all of teacher's jokes throughout the skit. Picks up class register and starts calling roll*) Anderson.

ANDERSON. Here.

TEACHER. Burlew.

BURLEW. Here.

TEACHER. (*Calls two or three more names and the students answer "here." Then Skinner, a tall, lanky, "anything for an easy life" youth strolls in very nonchalantly*) Skinner! You're late.

SKINNER. (*Very much surprised*) I am!

TEACHER. You am. (*Class laughs*) Have you an excuse?

SKINNER. (*Never lost for an answer*) I was on hall duty outside the study hall during the passing of classes and there was considerable indigestion down there.

TEACHER. Considerable indigestion! You mean considerable congestion.

SKINNER. No. I mean considerable indigestion. There was so much congestion down there I got considerable indigestion. (*Class registers disapproval of joke with a chorus of "Oo-o-o-o"*)

TEACHER. I've heard worse jokes but I can't remember where. (*Class laughs*) Let this be the last time you come to class late without a written excuse. Take your seat. (*Continues calling the roll and reaches the name of "Harris," a colored boy of the*

"*Rochester*" *type*) Harris. (*No answer*) Harris! (*Still no answer*). Is Harris here? (*A loud snore is heard*)

LAWRENCE. (*Smallest member of the class pipes up*) He's here. (*More snores by Harris*)

TEACHER. (*Looks Harris over*) To quote my old friend "Bill" Shakespeare, "Ambition should be made of sterner stuff." (*In a very loud voice*) Harris!!

HARRIS. (*Awakes with a jump*) Yes sir.

TEACHER. Are you here?

HARRIS. (*Still in a daze*) What class is this?

TEACHER. 10th Geometry II.

HARRIS. (*With great assurance*) Then I'm here. (*Pause*) And rarin' to go.

TEACHER. Rarin' to go back to sleep. (*Class laughs. Finishes calling roll. Then goes through business of getting ready for class recitation*) Yesterday we were discussing a new topic, locus. During the course of the period, you were exposed to several constructions which should help you to solve future locus problems. Before we take up any new work, let's review some of the things we discussed yesterday. What does this word "locus" mean. Miss Conrad?

MISS CONRAD. The word "locus" is the Latin word for place. When we speak about the locus of a point we mean the place where we can find all the points that satisfy a given condition stated in the problem.

TEACHER. (*Trying to catch somebody napping*) Do you agree with her, Thompson?

THOMPSON. (*Very much confused*) I-I-I—didn't hear what she said.

TEACHER. I thought so. You looked as though you were dreaming.

THOMPSON. I wasn't dreaming but I was thinking about a dream I had last night.

TEACHER. You should be thinking about geometry, not about your dreams.

THOMPSON. Well I was thinking about geometry, too. I was thinking that maybe if I knew a little more geometry than I do, I wouldn't have had to work so hard in my dream last night.

TEACHER. This is beginning to sound interesting. If somebody got you to do some work, I'd like to hear more about him because he's a better man than I am. (*Class laughs*) Let's hear what your dream was all about.

THOMPSON. Well, last night I dreamt I was fishing in Cheesequake Creek (*localized for laughs*) when along came Majahara (*a magician who had recently entertained the student body*). He asked me if I had caught any fish and I said, "Quite a few." He said, "I'm pretty hungry, young fellow. If you make a fire and cook me some of those fish, you won't be sorry." So I made a fire and we had an old-fashioned fish fry. When we finished, he gave me a piece of paper and said, "Follow the directions on this paper and they will lead you to some of Captain Kidd's buried treasure." I glanced at the paper to see what was written on it. When I looked up, Majahara was gone and in his place were a pick and shovel. I was sorry that he had disappeared, but I was too anxious to find the treasure to waste any time looking for him. I threw the pick and shovel into my boat, hopped in, and rowed up the creek to a spot mentioned on the paper. When I got there, I followed the directions carefully. I dug and I dug and I dug. All night long I dug, but I woke up this morning without finding the treasure.

TEACHER. That's an interesting dream but what makes you think that geometry might have helped you to find the treasure?

THOMPSON. I think that if I had known something about locus, I would have found the spot where the treasure was buried right away, and I wouldn't have had to dig all night for nothing.

TEACHER. Maybe you're right. Do you remember what the directions were?

THOMPSON. I think I do.

TEACHER. Let's hear them.

THOMPSON. They went something like this: "Starting at a skull and bones mark on the bottom of a black rock on the shore of Cheesequake Creek near three trees and Applegate's Brook, go sixty paces in a line due east. There drive a stake. Locate a point thirty paces from this stake and twenty paces due south of the line between the mark on the rock and the stake. There you will find the treasure."

TEACHER. I think the directions on that paper were sufficient to determine the position of the treasure.

THOMPSON. That's what I thought.

TEACHER. Let's make a drawing to show how to locate that treasure. Did you find the mark on the black rock near three trees?

THOMPSON. Yes sir.

TEACHER. Then the first thing to do is to choose a point to represent that mark. Go to the board and do that, will you Anderson? (*Anderson goes to board and chooses a point*) What does that point represent, Anderson?

ANDERSON. That point represents the skull and bones mark on the bottom of the black rock.

TEACHER. What's the next thing to do, Clark?

CLARK. Locate the point that is sixty paces due east of that point.

TEACHER. Before he does that, Burlew, what would you advise him to do?

BURLEW. Well, the first thing I'd do would be to name that point on the board.

TEACHER. That's a good idea. What do you suggest calling it, Burlew?

BURLEW. I'd call it R to keep in mind the fact that the rock is located at that point.

TEACHER. A good suggestion, Burlew. Name that point R.

ANDERSON. (*Anderson names point*) Are we now ready to locate the point that is sixty paces due east of the rock, Miss Conover?

MISS CONOVER. I don't think so. I think we should first choose some convenient unit of measure and let it represent ten paces.

TEACHER. That's another good suggestion. Let's have a unit of measure, Anderson. (*Anderson chooses a unit and labels it 10 paces*)

TEACHER. Now are we ready to locate the point that's sixty paces due east of the mark on the rock, Burlew?

BURLEW. Yes Sir.

TEACHER. Find that point for us Anderson, and explain each step as you go along.

ANDERSON. Starting at R, I draw a line of indefinite length due east. (*Action*) Starting once again at R, I'll lay off a segment on the line of indefinite length that's equal to sixty paces. (*Action*) The other end of this segment I'll call "S."

TEACHER. Have you any special reason for naming that point "S"?

ANDERSON. It will help us to remember that the stake is located at that point.

THOMPSON. Mr. Chips, the directions said to drive a stake sixty paces east of the rock.

TEACHER. Raise your hand if you have something to say, Thompson.

THOMPSON. Yes sir.

TEACHER. Thompson wants you to drive a stake sixty paces east of the rock, Anderson. (*Anderson pictures the stake*) The stake is driven. What shall we do now, Miss West?

MISS WEST. Find the locus of points that are twenty paces due south of *RS*.

TEACHER. Describe that locus, Lawrence.

LAWRENCE. It's a line parallel to *RS* and twenty paces due south of *RS*.

TEACHER. Construct that locus, Miss West, and explain each step in the construction before you take it.

MISS WEST. I choose a point on the line *RS*. I name the point *A*. With *A* as a center and with any convenient radius, I describe an arc intersecting *RS* in two places. I name the points of intersection *M* and *N*. With *M* and *N* as centers and a larger radius, I describe arcs intersecting each other. I name the point of intersection *Z*. Then I draw *AZ*.

TEACHER. That's very good, Miss West. Who'll carry on with the construction? (*Lawrence volunteers*) All right Lawrence.

LAWRENCE. (*Goes to board to continue the work. These constructions are explained and performed one step at a time*) Starting at *A*, I mark off a distance on *AZ* that represents twenty paces. The distance from *A* to this point (*gestures*) equals twenty paces. I name this point *O*. Using the same construction which Miss West used, I shall erect a perpendicular to the line *AZ* at the point *O*. (*After finishing this step*) I name this line *CD*.

TEACHER. What do you know about *CD* Lawrence?

LAWRENCE. I know that *CD* is parallel to *RS*.

TEACHER. How do you know that?

LAWRENCE. (*Pointing out as he talks*) Earlier in the course we proved that straight lines in the same plane perpendicular to the same line are parallel.

TEACHER. All right, Lawrence, you may sit down. Of what use is the line *CD*, Miss DeForest?

MISS DEFOREST. All the points that are twenty paces due south of *RS* are located in that line.

TEACHER. That is to say, Fairfield?

FAIRFIELD. Every point on *CD* is twenty paces due south of *RS*.

TEACHER. So we know now where to find all the points that

are twenty paces due south of the line between the mark on the rock and the stake. Where shall we find all the points that are thirty paces from the stake, Clark?

CLARK. We shall find all the points that are thirty paces from the stake in a line circle whose center is the stake and whose radius is thirty paces.

TEACHER. Go to the board and draw that circle Miss DeForest.

MISS DEFOREST. First of all, I'll draw a working line. On this working line I'll lay off a distance that's equal to thirty paces. With S as a center and with this distance as a radius, I'll describe a circle. I'll name this point of intersection T.

TEACHER. Why do you call that point "T"?

MISS DEFOREST. Because that's where we'd find the treasure.

TEACHER. Do you agree with her Skinner?

SKINNER. Yes sir.

TEACHER. Go to the board and explain just why you would dig for the treasure at the point T.

SKINNER. Point T is in the line CD and we know that every point in the line CD is twenty paces due south of the line RS. Point T is also in the line circle whose center is S and whose radius is thirty paces, and we know that every point in this circle is thirty paces from the stake. So T is a point that fulfills the conditions stated in the directions which Majahara gave Thompson and if Thompson had dug there, he would have found the treasure.

TEACHER. (*Thompson raises his hand*) Yes, Thompson?

THOMPSON. Mr. Chips, how could I have made all those constructions?

TEACHER. You said you were fishing, didn't you?

THOMPSON. Yes sir.

TEACHER. Then I suppose you had a fishing line. Is that right?

THOMPSON. Yes sir.

TEACHER. You see me after class, and I'll show how you could have used your fishing line in making those constructions. (*Looks at his wrist watch*) Well, it's almost time for the bell. Before the bell rings, however, who will sum up in one good sentence the one big thought that we should carry away with us today. (*Harris, the colored boy raises his hand*) Do you mean to tell me that you stayed awake all through this, Harris?

HARRIS. (*A little insulted*) Yes sir.

TEACHER. I'm almost afraid to ask you but I'll take a chance.

What is the one big thought that we should carry away with us today?

HARRIS. If you study geometry, you won't have to work while you sleep.

(*Everybody including teacher faints*)

CURTAIN

ADAPTATION OF THE DEMONSTRATION LABORATORY TO THE HIGH SCHOOL

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It is a matter of common knowledge that three difficulties with teaching physics successfully in many high schools are (1) lack of equipment or lack of duplication of equipment (2) shortened time allotment (3) increased enrollment. All of these have for obvious reasons caused an increase in the use of the demonstration method in the classroom in preference to individual laboratory work. Many times however, an instructor will perform a demonstration with the students preferring to do it themselves. This is made obvious by noting the numerous times a portion of the students remains after class to push a lever or pull a switch for a repetition of the demonstration.

The desire to give the students more first hand contact with the equipment has led to a plan at our high school of setting up a series of demonstrations on a given section of physics such as "Heat and Temperature." This plan is an outgrowth of visits made to the Demonstration Laboratory at the University of Chicago. The students are given written directions on each of the demonstrations which are about ten in number and then sent to the laboratory where they may perform the experiments either singly or in pairs. If the class is large, half may go one day while the other half completes a reading assignment in the classroom. The "writeup" is a simplified question type designed to direct the student into the experimental method of finding out scientific principles.

This plan allows the student to see first hand the phenomena desired and avoids the necessity for having many sets of the same apparatus. Current purchases may be directed toward accumulating a wider variety of equipment and some of it may be set up permanently if space is available and duplication of clamps and ordinary essentials is allowed. By a wide variety I refer to several demonstration pieces which will enrich the teaching of what we do teach and help do it more thoroughly rather than to bring in more topics of physics.

Since space is not available and duplication of essential equipment at our school is not feasible as yet, it is not possible to leave the demonstrations set up permanently, but a given series may be set up as long as is necessary for the study of the given section. The equipment may be left up so that during the study of the section, a student may go to the laboratory and reaffirm some of the answers to certain questions not fully settled in his own mind.

A good professor is a student who can also teach.—DANIEL COIT GILMAN.