MASSACHUSETTS INSTITUTE OF TECHNOLOGY

UNIVERSITY OF WISCONSIN - MILWAUKEE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Mass.

Department of Biology and Public Health

February 5, 1929

Mr. G. A. Pennock
Assistant Works Manager
Western Electric Company
Hawthorne Station
Chicago, Illinois

My dear Mr. Pennock:

Letters and reports will henceforth be sent to you in duplicate in order that you may have a copy for your file and a copy for the new division dealing with tests and interviews.

A supplementary report is now being prepared which will present the present status of our test studies and for that reason I shall not go into a discussion of the present status of our problem in this letter. It seems to me that our general situation at present is as follows: We have obtained a greatly increased output in the testroom. We have shown that the cause of this increased output has not been relief from neuro-muscular fatigue. Last spring we were confronted with the problem of deciding whether the greater output was due to improved physiologocal conditions or improved mental conditions. We have elminated the first of these possibilities rather effectively. Judging from the literature dealing with output this is a rather important step since most authors apparently feel that it is the muscular system which limits output in the usual factory process.

Now that we have reason to believe it is the nervous system which controls the rate of production in this type of process, our problem is to analyze further the factors involved in nervous control. Were we dealing with a controlled output from operators who were not trying to make the highest possible production? Have the conditions of the test merely taken away the opportunity for individual output control? How large a factor was the opportunity to earn more money in the small gang? Have we developed here a process of training like that in which the athlete is trained to improve his record? Is output limited by fatigue of the nervous system? Is preoccupation the important factor in limiting output? What is the relative importance of improved working conditions and which improvements are of greatest value? How can the benefits secured in the testroom be extended to other departments in the plant?

The above are some of the fundamental questions now confronting us and the tests we have under way will, to some extent at least, help us to separate the factors and solve the many-sides problem. At the same time it seems to me that we are gaining a useful picture of certain personnel problems which will make it easier to answer various problems which arise from time to time like the problem of overtime.

Atached hereto is a list of the proposed activities for the immediate future which will be carried forward by Mr. Putnam and Mr. Hibarger when approved by you.

Sincerely and respectfully yours,

(signed) C. E. TURNER

CET PB

List

DP

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Mass.

Department of Biology and Public Health

April 8, 1929

Mr. M. L. Putnam
Chief of Inspection, Personnel Division
Western Electric Company
Hawthorne Station
Chicago, Illinois

My dear Mr. Putnam:

The last batch of output data and the individual and fatigue-point data with your letter of April 2 have arrived O.K.

Within about two weeks I shall send to you a rough draft for the proposed supplementary progress report which we are getting out at this time.

Sometime in the near future we ought to make an analysis of the output at different fifteen-minute or hour periods during the day. We have a good analysis of the variation in output according to the different days of the week but we have never as yet made careful analysis of the variation in output during the different hours of the day. We probably cannot complete such an analysis to include in this supplementary progress report which is coming along now but I would like to have you give the matter consideration and make up such data there at the plant if possible or, if you desire, the original output records by fifteen-minute periods would be sent back here and I could have Mr. Morrill do them.

Probably the simplest procedure would be to average the output by fifteen-minute periods since the rest period would break up the hourly output if we seek to average those according to the different features of the testroom study. Anyhow we would have to use fifteen-minute outputs which were computed from the tape in making up our results and they could easily be combined into hourly curves if we choose to do so. You know, I think, that we did not read the tape for fifteen-minute outputs during the summer and fall and have read the tape for only five weeks in period twelve in order to compare variability with that in previous features. I think that we would have enough data if we compute average output by fifteen-minute periods of the length of time during which we have readings from the tape.

When these data are put up in the first place it would perhaps be just as easy to separate the days of the week. That is, the person who is drawing off the data would have six sheets before him, one for each working day of the week, the different fifteen-minute periods would be arranged in columns across the page and the date of the day could be written down the left-hand margin. Data could thus be drawn off for separate days and then grand averages computed. We might learn that Mondays have a different output curve for example.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Mass.

Department of Biology and Public Health

June 6, 1929

Mr. G. A. Pennock
Western Electric Company
Hawthorne Station
Chicago, Illinois

My dear Mr. Pennock:

As you know, I am carrying forward certain phases of our studies here at the Institute. Inclosed you will find brief reports on certain phases of these studies. These are in the nature of progress reports and the results to date may be summarized as follows:

1. No form of lighting by using light filters has been found which will improve the facility of reading the vascular skin reaction. It appears that greater precision can be obtained only through the electric cell or with the motion picture.

2. There is a significant shortening of the time in the vascular skin reaction directly following a meal. (This may be due to the withdrawal of blood to the internal organs.)

3. Acceleration of the heart rate does not change the time readings of the vascular skin reaction.

4. A reclining plank has been constructed and experiments have been started to determine conditions which give relaxation following different types of work. Relaxation on the relaxing board is compared with relaxation lying flat and sitting down. Our data are not yet sufficient to draw conclusions but certain definite values for relaxing have been demonstrated especially for operators who have been in sitting positions.

These studies both deal with the vital problem of fatigue and recuperation. They are difficult problems but I believe we shall make some headway with them as we continue our studies.

Carbon copies of these reports and of this letter are sent to Mr. Putnam.

Very truly yours,

(signed) C. E. Turner

CET PB
Reports

DP

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Mass.

Department of Biology and Public Health

November 26, 1929.

Mr. M. L. Putnam
Western Electric Company,
Hawthorne Station,
Chicago, Illinois

My dear Putnam:-

I have been giving some further thought to the designing of a recording device and I am sending you the following items which express the situation as I see it.

There is no objection to making time the variable instead of the number of units.

The device should be adjustable so that a record could be made at the completion of any desired number of units from one to twenty. I suggest from one to twenty as a feasible range. For slow operations perhaps we would want to know the time at which each unit is finished. For operations taking approximately one minute, as in the case of relay assembly, we could use ten relays as the unit of measurement. Probably we would not want to use odd numbers of output units, but would be most likely to use one complete operation or two or five or ten or fifteen or twenty.

The recording tape should be in minutes and decimal parts of minutes, rather than in minutes and seconds. See what a flexible system we would have if we were counting time as the variable for the assembly of Relay Units and the time was expressed in minutes and decimals.

The question arises as to whether we want to use a tape or some other device, for recording the end point of operation. The tape has certain advantages. It is easy to handle, easy to store, and inexpensive. Our machine may be made to record the output of several operators at once, if a tape is used. We can either buy a tape which is specially stamped or we can probably stamp the tape as it moves through the machine under an inked cylinder with cross markings. The length of the tape would depend somewhat upon the size of the hole which is punched or the mark which is made on it at the end point. There is no great disadvantage, however, to accumulating tape in considerable length so that we could have our minute intervals and tenth minute intervals sufficiently far apart.

Have also given a little thought to the idea of some type of record which would involve the principle of the time clock, start from zero, record the time interval at each point, and then drop back to zero and start over again. Even, so, we would probably want a tape for a continuous record and the simple tape is probably the best arrangement.

I should be glad to be kept in touch with plans if you go further in the development of this machine before I come to Hawthorne again. I don't think I can help in designing the beast but I may be able to suggest some adaptations in its construction and possibilities which would make it more useful.

The umbrella has returned O.K. I hope it was not necessary to turn it over to the Engineering Research Department to get it folded up.

Cordially yours,

(signed) C. E. TURNER

CET:ES

Massachusetts Institute of Technology

Department Of Electrical Engineering

Cambridge A, Mass.
April 8, 1930.

MR. M. L. Putnam
Western Electric Company,
Chicago, Ill.

Dear Mr. Putnam:

As you probably know Mr. Pennock spoke to me a week or so ago concerning the possibility of coming permanently with the Western Electric Company to work on your industrial research. I understand that this was due largely to your suggestion and hence wish you to know how greatly I appreciate being considered. As I told Mr. Pennock, I know of no other place I would prefer to the Western Electric Company if I were to enter industrial work; if it ever should seem advisable for me to leave the Institute, I think that your organization is the first one to which I would turn to seek work. My friends criticise me most severely from time to time because I do not take up attractive industrial offers which come my way, and I must confess that most of my defense is baded upon sentiment. In the first place, I am very happy in my present work, and cannot visualize any industrial situation in which I would be quite as happy. There are a number of problems in connection with my work in which I am very deeply interested and which I should leave partially completed only with very great reluctance. In addition to this, I am very much in love with Boston and New England, and perhaps have a stronger natural attachment for the Institute than most of my associates. This is largely on account of my grandfather's acquaintance with General Walker (one of our former presidents) and other items of family history which extend over several generations. I mention these things merely in hope that you will understand why I have not considered more in detail the possibilities of a situation which I am sure would afford most excellent opportunities.

Another thing which has prompted my letter is a speech by Stuart Chase which I heard last night at the Ford Hall Forum. The title was "Men and Machines" and the speech contained little which could not be read in his work of the same title, but he made one statement which I thought would

interest you and Mr. Pennock. After praising the work of the Fatigue Research Board of London, he said that in this country the General (as I got it) Electric Company in their works at Hawthorne is conducting an experiment in industrial fatigue; that it is a perfectly hard-boiled attempt to find the point on a curve of rest pauses where the most work can be gotten out of their employees, and that the plan is to put the whole plant of 40,000 employees on a rest pause schedule because it has been found to pay. He described briefly the test room set-up for the relay group and praised the thoroughness with which the investigation has been conducted. He left no doubt in my mind as to his appreciation of this, but he left no doubt in my mind also that in his opinion it is a perfectly hard-boiled situation: that is, if you had found that the rest pause scheme and improved supervisory tactics produced greater happiness but no greater output your interest would not have continued. I metnion this particularly because I remember that my chief criticism of my first draft of Mr. Pennock's speech was that such an impression might be gathered. It is difficult when you plot most of your results in terms of production, to convince people that increasing of production was not your primary interest. If you have any reprints of your and Mr. Pennock's speeches I wish I might have one.

This June I plan to attend the annual meeting of the Society for the Promotion of Engineering Education at Montreal. Following that I expect to spend about five weeks with the General Electric Company at Schenectady doing odd jobs in Mr. Doherty's (consulting engineer) office and attending their Professors' Conference. About the end of July I expect to return to the Institute to take a light teaching assignment and hope also to complete one stage of a research on thermal conductivity of metals which I have had under way for quite a time.

I hope that Messrs. Wright and Dickson will look me up when they come here.

Cordially yours,

R. H. Frazier.

DP

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Mass.

Department of Biology and Public Health

September 26th, 1930

Mr. W. L. Putnam
Western Electric Company
Hawthorne Station
Chicago, Illinois

My dear Putnam:

I am enclosing herewith a memorandum concerning the study on work cycles. I am anxious that this report should not be used in such a way as to discourage the initiative of the people who prepared it, or to make them feel that I am anxious to discourage their endeavor. As a matter of fact, I think the study showed commendable initiative and that it was worth making, and I feel that courage and initia ive are qualities we want to maintain on the part of our young assistants. At the same time, it is up to you and me to see that the impression does not go out that the Western Electric Company has found evidence of regular cyclic fluctuation in out-put, until we have found such evidence. It seems to me that no valid evidence at present exists.

I know that your unusual administrative ability will find a way to adjust this report and the working group out there, to each other.

You will note that the supplementary section in my report really does not belong there at all and is not considered in the conclusions. We had made computations which indicated the reliability of predictions concerning the termination point of cycles on the basis of the old figures and I thought you would be interested in them. From the standpoint of policy that section can be disregarded. It merely shows us that with much more liberal interpretation of termination points than we have any right to make, we could not predict, with any satisfactory reliability, a series of low points in production.

Turning to another matter, ----what do you want me to do in connection with the progress report of your division. I can plan to come out at that time when you have your general section shaped up and work there for a day or two in helping to put together that section of the report which deals with test-room activities, or you can send to me the general plan of the report and I will shape up a tentative copy for the test-room section before coming out. Maybe, on the other hand, you would like to have all the sections shaped up by the various responsible people in your department and

that you then would like me to go over the test-room section with you. I shall be glad to do whatever you want me to in relation to this report. I am, of course, anxious to at least review the test-room section material.

Very cordially yours,

(signed) C. E. Turner

CET/K
Enc.

DP

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Mass.

Department of Biology and Public Health

October 13th, 1930

Mr. W. L. Putnam
Western Electric Company
Hawthorne Station
Chicago, Illinois

My dear Putnam:

Thanks for your letter of October 10th. During the next few weeks I will put together material for a progress report on testroom activities. I think your plan for getting together after we have our respective outlines fairly well in shape, is a good one. Perhaps we could do this about the middle of November.

I am interested in your comments about next year's activities, unless something new has developed in connection with the mica splitting group since I talked with you, I believe we would do well to substitute a testroom group of men for it. It seems to me that we shall not be able to learn much from the mica group with the change of work which has been necessary.

One thing which I hope will not get crowded out of next year's activity is the development of the work recorder which we have discussed. I believe that that device will provide a new and valuable tool for studying employee effectiveness. With this device I believe we shall be able to analyze output using total output, maximum speed, minimum speed, variability and fluctuation by hour, day or week, to give us a picture of the worker and his adaptation to the job in hand. I have just been reviewing a lot of English studies on industrial conditions of fatigue and I am impressed anew with the value of such a record as that which we seek. Many of the studies on employee effectiveness suffer from insufficient and poorly collected output data. Many of them also suffer from having been carried out by a physiologist who failed to appreciate changes in working conditions which may probably have affected his results. Many of the studies also have failed to check the reliability of the data which is presented. We are anxious, of course, to get other sources of information in addition to output data, and at the same time I feel sure that we are on the right track in using output data together with a thorough knowledge of working conditions as basic material in assembling our reports.

The information about a high output during the good rain, is interesting.

Cordially yours,

(signed) C. E. Turner

CET/K

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Mass.

Department of Biology and Public Health

November 6th, 1930

Mr. W. L. Putnam
Western Electric Company
Chicago, Illinois

My dear Putnam:

I am getting together materials and plans for the next report and I want to take up two or three items in connection with it in this letter, and also make definite arrangments for my visit to the plant, at this time if possible.

I wish you would have sent to me a copy of the last issued mimeographed progress report. I have a carbon copy of the material which I prepared but I think there were changes and additions to that material in the last progress report which went to the officers of the company. I do have a copy of the special report on "rest periods" and I judge that we can leave out any extensive consideration of rest periods in the present report although we have some new evidences on the five day week.

I think it would be a good thing for Hibarger to bring up-to-date the experience of the girls in the testroom groups so far as absenteeism is concerned, if it has not already been brought up-to-date.

You and I will want to talk over the way in which material from the interviewing program will be used. That is, whether pertinent data will be included in the testroom studies, whether testroom data will be added in support of the interviewing findings or whether the material will be separated and cross-referenced.

I shall send out to you soon, or bring out with me, a series of reviews of various articles which relate to our field and which we have covered in reading here. I shall want to discuss with you whether it would be worthwhile for us to prepare reports for our superiors dealing with other studies in this field as viewed from the standpoint of the Western Electric studies.

We may want to talk over also, the feasibility of trying some tests on the organs of perception for the speed and precision of reaction as indicating the physical effectiveness of the worker.

I wish you would ask Hibarger to make a list of the things which he thinks should be covered in the next progress report. I will, of course, do this myself but he is so much closer to the study than I am that I think he will be able to suggest to us, for our consideration, a lot of details which might not readily occur to us.

In regard to the time for my visit, I would like to propose the following arrangment. I should like to leave Boston on the Century, Thursday the 13th, arriving at Englewood on Friday morning the 14th. We could put in the rest of Friday and Saturday morning going over our general plans and making our outlines coincide. I would then have Saturday afternoon and Sunday to work on my own time and I could probably make progress faster there than I could at home. I could then put in Monday and Tuesday at the plant in working upon those items of the report which are involved and which we need to do together. I can leave Tuesday evening and get back east in time to go to the White House Conference on Child Health which I must attend Thursday or Friday. This plan would give me about two and one-half days at the plant, and one and one-half on my own time in isolation and solitary confinement at the hotel. This is the one time in the month when I could get away from Boston without difficulty and this plan will provide a period of continual work which will carry us a long way in getting the progress report in shape. Please let me know whether this plan is satisfactory from the standpoint of your own schedule and the activities at the plant.

Cordially yours,

(signed) C. E. Turner

CET/K
Enc.

P. S. Very likely I shall spend a little time with the people in charge of the health classes for employees, during this visit.

Sincerely,

C. E. T.

DP

MASSACHUSETTS INSTITUTE OF TECHNOL GY
Cambridge, Mass.

Department of Biology and Public Health

December 4th, 1930

Mr. W. L. Putnam
Hawthorne Station
Western Electric Company
Chicago, Illinois

My dear Putnam:

I am enclosing herewith and sending by air mail the organized outline which we discussed when I was in Chicago, and which I promised to prepare. Notes are added on the right hand side giving further information of the data to be prepared for the writing of our report. This outline will be more meaningful if it is read with a copy of our last report in hand, and if read with reference to the pages indicated in the notes.

I think we have our material pretty well organized but there is a lot of data to be brought together before we can write several of the remaining sections. My suggestion is that Hibarger go over this outline carefully and take steps to put into shape the data which I have indicated as necessary. He should also make a list of other data which we have to draw upon and make a list of new facts or findings which he thinks our experience has indicated. If he has some special problems or questions which he thinks I ought to consider at present, he can send them to me.

In accordance with the plan which we discussed when I was out last, I shall plan, if agreeable to you, to come to Chicago directly after New Year's. I have to be in New York for the Metropolitan Life Insurance Company on the 31st, and I have other responsibilities in New York so I do not know just when I can leave. It is possible that I might get to Chicago on Friday, but it is perhaps more likely that I would be there early Saturday morning. I would have some time of my own on Sunday to put on the work after our Saturday conference and I could stay three or four days the next week in order to get our material into the first fundamental draft in such a form that it would be sound from the standpoint of the various members of our group who see different sides of the problem.

At this next visit we should also give some time to the question of the Test Room Group of men and also to the question of recording apparatus which the plant is working upon. Another thing which you and I ought to consider together perhaps is the interrelationship between the Test Room Study and the other activities of the Division in order to see whether there is material from the interviewing side which ought to be used in this report, as throwing light upon some of our special problems, and whether there is any way by which we can use the Test Room material to better advantage in the interviewing program.

There are two other matters outside the field of our immediate interests which I should like to look into a bit if I have time, one is the program for health classes which I have promised to discuss further with the people in charge. It may be that this would be an extremely propitious time for the development of the proposed extension in health teaching because the

employees have time to spend in a health class, and because we have now a group of employees who are most permanent and for whom health teaching would be most valuable to the Company, and because present economic conditions make health maintainence an unusually important consideration. The other thing is that I would like to accept the invitation which Mr. Davidson proferred me in your office when I was out last, to look up a new plan for the collection of data in the hospital. I may not have a chance to get to thes two items, however.

I wish there might be an opportunity som time for Professor Schell to sit in with us and talk over some of the phases of our problem. He is particularly interested, you know, in technique of supervisory control and he is a very able chap. Would it not be extremely worthwhile to add him to the discussion group you spoke of getting together sometime soon for a day or two, to discuss the whole problem? If those plans do not develop there may be some way by which we could discuss the general problems with him sometime, as I feel sure that he would have some constructive ideas concerning the use of our studies in supervisory training and supervisory control.

Please let me know at your convenience whether it will be o. k. for you if I arrive sometime Friday, January 2nd, or early Saturday morning, January 3rd.

Mrs. Turner is quite well again. I will tell you more about the situation when I see you.

Cordiall yours,

(signed) C. E. TURNER, Dr. P. H.

CET/K
Enc.

DP

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Massachusetts

January 8th
1 9 3 1.

M. L. Putnam, Chief of Industrial
Reserach Division, Hawthorne Works,
Western Electric Company, Inc.,
Hawthorne Station, Chicago.

My dear Mr. Putnam:

I just wanted you to know how much I appreciated your hospitality on Monday, and the opportunity which you gave me to see the very interesting work you are doing in educating supervisors.

I have felt that my trip to Chicago was most profitable but I have a sense of gult in taking so much of the time of yourself and your associate.

With kindest personal regards, I am

Gratefully yours,

(signed) Erwin H. Schell.

EHS/ob

DP

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Massachusetts

January 28th
1 9 3 1.

M. L. Putnam, Chief,
Industrial Research Division,
Hawthorne Works, Western Electric Co., Inc.,
Hawthorne Station, Chicago.

Dear Mr. Putnam:

I am looking forward to hearing from you with regard to the orange and white copies of your discussion material. My class starts February 9th and I want to get some of this material duplicated beforehand if possible.

With kindest regards and many thanks for your interest, I am

Sincerely yours,

(signed) Erwin H. Schell.

EHS/ob

DP

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge A. Mass.

February 10th 1931.

M. L. Putnam, Chief of
Industrial Research Division,
Western Electric Company,
Hawthorne Works,
Chicago.

Dear Mr. Putnam:

A thousand thanks for the record of your course discussions. The material is now in neostyle and I anticipate starting to use it very shortly. I shall be more than glad to tell you of results at some later time.

With kindest regards, I am

Gratefully yours,

(signed) ERWIN H. SCHELL.
Professor of Business Management.

DP

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Massachusetts

March 11th
1 9 3 1

M. L. Putnam, Chief of
Industrial Research Division
Western Electric Company,
Hawthorne Works, Hawthorne Station,
Chicago.

Dear Mr. Putnam:

Thank you so much for your additional discussion outlines, accompanying your letter of the 7th.

Our material covering the eight periods has been prepared so that the cards which you suggest will not be needed this year.

I am sending you herewith some of the preparatory work on your different periods. This has of course been construed to meet our particular needs. Almost all of the class are undertaking an optional consulting service in English and these inter-departmental memoranda which they are writing are partly in order to afford material for consideration by our consultants. You will note however, that the answers to these questions give the boys practice in the proper consideration of the human element when writing memos!

I plan to tell you more in detail of our progress a little later.

With kindest regards and many thanks for your thoughtfulness, I am

Sincerely yours,

(signed) Erwin H. Schell.

EHS/ob
Encl.

DP