NEWARK ENGINEERING NOTES

VOLUME 3
NUMBER 1
OCTOBER, 1939

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THE PRESIDENT'S DIARY

October 5th

Always as College opens in the Fall we find ourselves faced with the same old problem, not perhaps in the same old way, but in a variety of ways, and that is the problem of exclusion of prospective students. We have done a little more this year, and have done it in a little better way than we have ever done it before. We have paid a little more attention to the boy as a well-rounded total personality, taking into account some of the facts a little outside his academic record, making his academic record if you please, the necessary but not the sufficient condition for entrance.

I think more and more we are coming to see that if the boy's personality represents the sum total of his reaction to his environment, and if the sum total is positive and shows any signs of leadership, that in the somewhat different environment of college the same general intelligence and characteristics may become evident. If there were only some way to make these young men come in early, and not wait until our sections are filled to overflowing and then hope to be accepted. But when a man comes in, for instance, from Central High School ranking second or third in a class of three hundred and forty-two, or something like that, it is very hard from a professional standpoint and from the standpoint of the public interest to say no to him. But this year, in looking over the candidates, I think we have a very high type of young man and there certainly are some signs of real leadership.

October 11th

As has been my custom for some years past, I have had a chance to talk to all four classes in the Day College and Twilight group as well, and it has been very helpful to me. You see, the President gets one year older every year and the Junior class, for instance, stays just the same age. In point of years then the gap seems to be a little wider, and as it grows wider I feel an increasing necessity to keep in touch with those younger men that we attempt to help and direct. I never come out of an experience of this kind without a very deep realization of the strength not only of our democracy but our system of free public schools; not that I consider an engineering college the most important thing. It is not one-tenth as important as the elementary or the secondary schools, but the material that we get from that source is of such a character that I think anyone would realize that our own national plan of government is entirely safe in their hands. The thing that continually surprises me more and more is the maturity of their judgment and the general high level of intelligence, and by intelligence I mean fertility of mind.

Mistakes which these young people make are mistakes of ignorance purely, and if they do not do what we think they should do, it is largely because of the fact that they are too experienced or we are too dumb to understand the nature of the misunderstanding.

In any school work, of course, there are many individual students and individual difficulties which for the moment may loom large and out of all proportion to the general averages. In these times when things seem to be stirred up abroad and in this country as well, when I hear in lectures over the radio and at lunch hour of the great sinister forces which are arising to overpower us here in America, it is then that I am thankful that I have a contact with these young people which is intimate, and I am thankful that there is a deep strong faith in the future, contributed primarily by my relations with my students. I was at West Point for dinner on Sunday and I came home with the same feeling.

Not long ago I had a chance to go through the Naval Academy at Annapolis and to meet some of the midshipmen there and to see a good deal of the ranking personnel of the Navy, as much as I have seen of the Army in the past. Somehow the more I see of youth the less frightened I become as to the future of America. It looks pretty bad when I hear the radio, it looks pretty bad when I read the newspapers, but when I look over six or seven hundred faces in convocation, America seems to be a pretty safe place.

ALLAN R. CULLIMORE

SOME PROBLEMS IN MOISTURE MEASUREMENT

By William B. Wible, B.S. in E.E.

The problem of obtaining a particular moisture content in a product in production has been coming to the attention of an increasing number of manufacturers. By proper control of this moisture content, it is being discovered that wastes may be eliminated, production increased, or a better product produced than has been possible previously.

Along this line a problem presented itself in the form of a carpet whose back was to be sized. The carpet, after receiving the size, was passed through a can dryer consisting of some eighty-odd, steam-heated, rotating cans. Experience had shown that carpet having a moisture content above a certain value would spoil due to the formation of mould, while a moisture content below a certain value produced a less pliable carpet and was wasteful of steam and production time. Control of moisture content was, of course, available by changing the speed of the cans. Measurement of the final product was rather inaccurate, and whether or not the product was satisfactory depended upon the knowledge and skill of the operators. Each roll of carpet was weighed before sizing and after drying, the pick-up in weight being some measure of the amount of moisture, after an allowance had been made for the weight of the size. This allowance depended upon the foreman's estimate of the amount of size picked up, since the amount was not constant. Since possibly a dozen rolls were a day's production, it was obvious that the time between weighings was great enough to allow production of a damaged roll even though the previous ones were good. This possibility was taken care of in some measure by the experience of the operators in feeling the carpet. Needless to say, a certain amount of waste resulted due to the human factor. If this waste was to be eliminated, continuous measurement of the product was necessary. Hence the problem to measure the moisture content of carpet with a sized back.

From laboratory tests it was found that the average moisture content by weight, of a good carpet, was about six per cent. This was for a uniform distribution of moisture throughout the sample. However, on production a different condition was obtained due to the construction of the can dryer. Since the carpet was contacted first on one side and then on the other by the hot cans, the moisture in the final product was concentrated in the center, leaving the surface comparatively dry. It was this moisture in the center which had to be measured, and it was this comparatively dry surface that presented the greatest obstacle to the measurement. It then became necessary to design a circuit wherein the high electrical resistance of the surface would not interfere with the measurement. A normal sample with uniform distribution of moisture was found to have an electrical resistance of the order of 50,000 megohms. If the moisture were concentrated near the center, as is the case in production, it is obvious that the total resistance of the carpet would be much higher, especially with a comparatively dry surface.

Another condition which had to be considered was the fact that wire or other metallic materials occasionally find their way into the carpet, presenting the possibility of occasional short circuiting of any contact-plates or rolls which might be used in attacking the measurement problem by some means of measuring the resistance or capacitance of the carpet. The circuit design, therefore, had to be such that a short circuit could have no damaging effect on the instrument.

It also became necessary to install the pick-up head at such a point within the dryer that the operators could determine the condition of the carpet in time to keep a uniformly good product. Measurement during the drying process brought with it the problem of preventing moisture from gathering on the head, or of designing a head such that any moisture which might gather, would not affect proper indication of the moisture in the material. This had to be considered since vapor might contact parts whose temperature was below the dew point, thereby causing troublesome condensation. Then there was the transmission line from the head to the instrument that had to be considered since it operated under practically the same conditions as the head.

In the circuit design it was also necessary to consider that the instrument had to be direct reading, with no manipulation necessary to determine the moisture content.

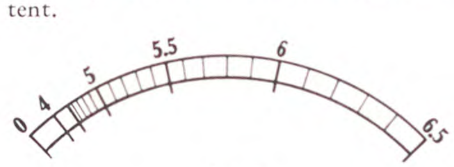

Fig. 1

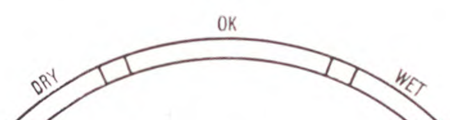

Fig. 2

Along with the solution of these problems, came the problem of instrument calibration. Because of lack of uniformity in the distribution of the moisture throughout the carpet, it was necessary to calibrate the instrument by sampling and weighing on the production line, even though laboratory facilities were available for producing samples of uniform moisture content. In calibration the use of either of two scale types was possible, one, a scale calibrated directly in moisture content, and the other, a scale marked DRY—OK—WET. A scale calibrated directly in moisture content is shown in Fig. 1, the calibration being rather cramped at the left and open at the right. This particular characteristic and adjustment produced a scale as shown in Fig. 2, after proper tolerances were determined. This scale made use of a band colored red, yellow, and green, the words DRY and WET appearing above the red sections and OK above the green section. A yellow space between the red and green sections indicated a doubtful condition. This, of course, made a scale easily read by operators who were primarily interested in producing a uniformly good product.

The original purpose of measuring the moisture content of carpet was to eliminate waste and produce a more uniform carpet. Actual results showed that not only had this been accomplished, but production was also increased. The increase in production was obtained even though those connected closely with the particular work had previously insisted that the maximum had already been reached.

These problems have concerned one particular case, but are typical of problems arising from the desire to increase quality and efficiency via moisture control. Obviously other textiles and paper can be measured by adjustment of the instrument characteristic and range to suit the particular application. With a scale such as Fig. 2, the instrument may be adjusted to take care of a number of different items that may be run through a particular machine. In changing the type of material it is necessary only to set the range of the instrument, by means of a rotary switch, for the material to be tested. It is also possible to measure granulated and powdered items by changing the type of head, in fact, most items where a continuous determination of moisture content of a product is necessary. The fact that this particular case was one of measurement and manual control need not cause the possibilities and advantages in recording and automatic control to be overlooked.

WE CAST OUT 9's, OR 3's

By ELMER C. EASTON, B.S., M.S.

Instructor in Mathematics, Newark College of Engineering

The fear of ignorance is the greatest handicap which a user of mathematics can have. Confronted by a problem not quite like any in his high school or college text books, many a person will give up in despair, afraid that the solution might involve some type of "higher mathematics" in which he has had no training.

Actually, mathematics is nothing more than a language. Anyone who can state a problem clearly in English can formulate that problem mathematically. Perhaps his notation will not be that used by experts, but then this may be an advantage in that, having invented them, he will know the meaning of all symbols at the start.

No doubt many of us in our training in arithmetic were taught how to check a sum by "casting out nines". Few people have gone far enough into the study of numbers to have seen a proof that this check is valid. Let us, therefore, attempt such a proof, using our elementary mathematics as a language, and not depending on conventional approaches or previously stated theorems.

We shall begin by outlining the method of checking a sum by "casting out nines". The procedure is as follows. Add each horizontal row of digits, divide each of these sums by nine, and write down the *remainders*. Add these remainders. Divide the sum of the remainders by nine, and write down the *remainder* from this division. This final remainder should equal the remainder found by dividing by nine the sum of the digits in the answer. For example, in the sum shown here, the sum of the digits in the answer is 19. Dividing 19 by 9 gives 2 1/9, the remainder being 1. This agrees with the remainder formed from the rows of the problem. Since the remainders agree, we say that the problem has *probably* been solved correctly. (We cannot be *sure* the result is correct, since the remainders would be the same if the digits in the answer were transposed. There are also, of course, many other combinations of digits which would yield the same remainder, e.g., 244, 325, 928, etc.)

134	→	8
246	→	3
359	→	8
——		—
739	→	1

Let us now carefully examine the method by which we add. In the sum shown, we add the right hand column of digits, obtaining the total 19. We write down the 9, and add the 1 to the column next left. This total becomes 13, of which we write down the 3, and carry the 1 over into the column next left, etc. In other words, we write down under each column (except that farthest left) the last digit of the sum of the numbers in that column.

Now, if our proof is to be valid, we must not work with any one specific sum, but must speak of sums in general. Suppose we use the sum shown below, where the Z's represent the units column, the Y's represent the tens column, etc. Adding the right hand column, we get ΣZ which will be our symbol for "the sum of the Z's". Under this column we must write the last digit of ΣZ. To find this last digit, let us divide ΣZ by 10. This will leave the last digit alone behind a decimal point. Now if we strip the integral portion away from $\frac{\Sigma Z}{10}$ leaving only the decimal portion, and then multiply this decimal by 10, we will have the desired last digit of ΣZ. Suppose we invent an operator called D which, when placed in front of a number, strips the number of its integral portion, and leaves only its decimal portion. For example, $D(1.03) = .03$, $D(3.52) = .52$, etc. Then the last digit of ΣZ will be $10D\left(\frac{\Sigma Z}{10}\right)$.

$a_1b_1 \ldots\ldots y_1z_1$
$a_2b_2 \ldots\ldots y_2z_2$
$\ldots\ldots\ldots\ldots$
$\ldots\ldots\ldots\ldots$
$a_ib_i \ldots\ldots y_iz_i$
——————
SUM

This is written under the Z column, and the other digits of ΣZ are carried into the Y column. These other digits are the integral part of $\frac{\Sigma Z}{10}$ which was stripped away by the D operator. If we let W be another operator which when placed in front of a number removes the decimal, leaving only the integral portion, then the part carried into the Y column will be $W\left(\frac{\Sigma Z}{10}\right)$. (As a numerical example of the action of W, $W(1.03) = 1$, $W(3.52) = 3$, etc.) Adding the Y column gives $\Sigma Y + W\left(\frac{\Sigma Z}{10}\right)$. Of this, we write down $10D\left[\frac{\Sigma Y + W\left(\frac{\Sigma Z}{10}\right)}{10}\right]$, and carry $W\left[\frac{\Sigma Y + W\left(\frac{\Sigma Z}{10}\right)}{10}\right]$ etc. Thus the various digits in the sum are:

Units digit $\quad 10D\left(\frac{\Sigma Z}{10}\right) \quad$ under "Z" column

Tens digit $\quad 10D\left[\frac{\Sigma Y + W\left(\frac{\Sigma Z}{10}\right)}{10}\right] \quad$ under "Y" column

Hundreds digit $\quad 10D\left[\frac{\Sigma X + W\left[\frac{\Sigma Y + W\left(\frac{\Sigma Z}{10}\right)}{10}\right]}{10}\right]$

$\vdots$

$10D(\theta)$

$\vdots$

a's digit $\quad 10D\left(\frac{\Sigma a + W(\theta)}{10}\right) \quad$ under "a" (first) column

$$10D\left[\frac{W\left(\frac{\Sigma a + W(\theta)}{10}\right)}{10}\right]$$

$$10D\left[\frac{W\left(\frac{\Sigma a + W(\theta)}{100}\right)}{10}\right] \quad \text{etc.}$$

To add the digits in the sum as required in our check, note:

$$10D\left(\frac{\Sigma Z}{10}\right)=\left[\frac{\Sigma Z}{10}-W\left(\frac{\Sigma Z}{10}\right)\right]10=\Sigma Z-10W\left(\frac{\Sigma Z}{10}\right)$$

likewise,

$$10D\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}\right]=$$

$$\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}-W\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}\right]\right]10=$$

$$\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)-10W\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}\right]\text{ and,}$$

$$10D\left[\frac{\Sigma X+W\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}\right]}{10}\right]=\Sigma X+$$

$$W\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}\right]-$$

$$10W\left[\frac{\Sigma X+W\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}\right]}{10}\right]$$

Adding these three (the units, tens and hundreds digits) we get

$$\Sigma Z+\Sigma Y+\Sigma X-9W\left(\frac{\Sigma Z}{10}\right)-9W\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}\right]-$$

$$10W\left[\frac{\Sigma X+W\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}\right]}{10}\right]$$

Continuing likewise, the sum of all the digits in the total is

$$S=\Sigma Z+\Sigma Y+\cdots+\Sigma a-9W\left(\frac{\Sigma Z}{10}\right)-$$

$$9W\left[\frac{\Sigma Y+W\left(\frac{\Sigma Z}{10}\right)}{10}\right]-\cdots-9W(\theta)-$$

$$9W\left(\frac{\Sigma a+W(\theta)}{10}\right)-9W\left(\frac{\Sigma a+W(\theta)}{100}\right)-\cdots-0$$

Now let us follow the rules for checking. First we add the digits of the first row $(a_1+b_1+\cdots+y_1+z_1)$. Then we divide by 9, or to remain general, by some number n, giving $\frac{a_1+b_1+\cdots+y_1+z_1}{n}$, and write down the remainder, which is easily seen to be $nD\left(\frac{a_1+b_1+\cdots+y_1+z_1}{n}\right)$. Likewise the remainder for each row is obtained. Adding these remainders we get

$$nD\left(\frac{a_1+b_1+\cdots+y_1+z_1}{n}\right)+$$

$$nD\left(\frac{a_2+b_2+\cdots+y_2+z_2}{n}\right)+\cdots+$$

$$nD\left(\frac{a_i+b_i+\cdots+y_i+z_i}{n}\right)$$

Finally, this sum is divided by n, leaving a final remainder

$$nD\left[\frac{nD\left(\frac{a_1+\cdots+z_1}{n}\right)+\cdots+nD\left(\frac{a_i+\cdots+z_i}{n}\right)}{n}\right]=R$$

$$nD\left[D\left(\frac{a_1+\cdots+z_1}{n}\right)+\cdots+D\left(\frac{a_i+\cdots+z_i}{n}\right)\right]=R$$

This final remainder R should equal the remainder similarly formed from the digits of the sum, or $R=nD\left(\frac{S}{n}\right)$. But from the expression for S above,

$$nD\left(\frac{S}{n}\right)=nD\left[\frac{\Sigma Z+\cdots+\Sigma a-9W(\ )-9W(\ )-\cdots}{n}\right]$$

Now, if n were some integral factor of 9, say 1, 3 or 9, then 9/n would be an integer, and the "9W" terms above, when operated on by D, would disappear. Thus, if n is 9, 3 or 1,

$$nD\left(\frac{S}{n}\right)=nD\left(\frac{\Sigma Z+\cdots+\Sigma a}{n}\right)=$$

$$nD\left[\frac{(a_1+\cdots+z_1)+(a_2+\cdots+z_2)+\cdots+(a_i+\cdots+z_i)}{n}\right]$$

But, $(a_1+\cdots+z_1)=nD\left(\frac{a_1+\cdots+z_1}{n}\right)+nW\left(\frac{a_1+\cdots+z_1}{n}\right)$

Thus,

$$nD\left(\frac{S}{n}\right)=nD\left[\frac{nD\left(\frac{a_1+\cdots+z_1}{n}\right)}{n}+\frac{nW\left(\frac{a_1+\cdots+z_1}{n}\right)+\cdots+nD\left(\frac{a_i+\cdots+z_i}{n}\right)}{n}+\frac{nW\left(\frac{a_i+\cdots+z_i}{n}\right)}{n}\right]$$

but, since the W terms disappear when operated on by D,

$$nD\left(\frac{S}{n}\right)=nD\left[D\left(\frac{a_1+\cdots+z_1}{n}\right)+\cdots+D\left(\frac{a_i+\cdots+z_i}{n}\right)\right]$$

Hence, $R=nD\left(\frac{S}{n}\right)$ if n is 1, 3 or 9. It is evident, then, that a sum may be checked by casting out 9's or 3's. Casting out 1's is not really a check since the remainder is *always* zero.

(Continued on page 15)

IMPRESSIONS OF A NEW EMPLOYEE

An Engineering Student's Reaction to His First Professional Experience

By HERBERT ERDMAN

Junior, Newark College of Engineering

I

When a prospective employee first walks into an office to have an interview he is quite concerned with the impression he makes. He has heard much said about the importance of his first impression; therefore, he is dressed his best and is quite ill at ease. First his mind is too much occupied in thinking of what to do and what to say to form any of his own impressions. But later, if the interview lasts long enough, and if the interviewer does not force him to do most of the talking, he begins to examine this man and form definite impressions of him. In my own case, I have found in my interviews (including those which were unsuccessful) that I formed very definite impressions of the men. In fact, for the duration of the interview, that man represents the whole company in my mind. If he seems pleasant, the company is a good firm to work for; if he is obnoxious in any way, the whole company seems to be an unsympathetic group.

Here might be a place for companies to reduce their human relations problems. By placing a man with a pleasing personality in their personnel department, so that the new employee's first contact with the company will be a pleasant one, the company will remove one obstacle in the path of smooth relations between employees. This point might be debated, however, for it might be said that a busy personnel man does not have time to concentrate upon making good impressions on all the men he interviews. Many companies adopt the hard-boiled attitude of, "We want the best man we can get at our own price, and he should feel very lucky to get the job." I have seen employers who seemed to have just this attitude. The company should go half way and conduct an interview as they would a business deal, with the parties speaking on equal terms, rather than have the employer control the interview. In my opinion it is of the utmost importance to have an employee enter the service of a company thinking, "This certainly seems like a fine place to work"; rather than, "I hope that fellow isn't my boss."

II

In the excitement of his first visit to a company, the job-seeker fails to notice much of the building and offices. If he has to wait for his interview for any length of time, however, he does have an opportunity to observe the room in which he is waiting.

In my experience I have found that the observation of such places led to the forming of impressions of the company. For a few minutes I go over to myself the things I want to say. Then if the employer fails to appear, I begin a procedure which to my knowledge is common to everyone, that is, to observe, thoroughly and quite unwittingly, the contents of the room. The furniture, the walls, ceiling, floor covering, inkwells, pens, application blanks, calendar, magazines, and all other articles are observed, and perhaps a fleeting glance of an adjoining office when a door is opened. All these things may seem very trivial, but at a time such as this, when the mind is extremely active, these ordinarily unimportant things assume great importance, and for the duration of the wait, they represent the company itself.

Later, when the new employee has worked for a few days, he has a chance to observe more of the building and offices. The lighting, heating, washrooms, elevators, and other users of the building all tend to impress the employee for or against the company. Although one may get used to an old, ill-kept building, there is no doubt that a new employee is impressed unfavorably by it. He becomes prejudiced against the company because of the appearance of the building.

On the other hand, a new building in a good neighborhood will induce the employee to overlook other objections to the company. Both of the companies which I have worked for have been located in good, up-to-date offices, but I have been in some which I considered poor, during my search for a job. If I had been employed by one of these latter companies, I would have had to overcome these first impressions.

III

The first day of employment usually has a period of introductions. The new employee is taken around and introduced to all those with whom he will work. Most of the names are soon lost in the confusion, to be relearned later by the slower but more lasting method of listening and observing. I found that while I couldn't remember many of the names of the employees, I did remember them by the impression they made on me. I associated each with some action or manner which was typical of him. Instead of thinking of one as "Harry" I would think, "There is the man who is always wandering about with apparently nothing to do," if that happened to be my impression of him. I noticed that I associated each man with some such impression until I learned his name. I also noticed, however, that first impressions of men can often be misleading. It requires several weeks of close contact with a man before any substantial conclusions about his character can be drawn. The man who seems to be very friendly and jovial the first day may turn out to be very different later, and men who seem cool and distant at first often turn out to be real friends.

I think it would be a good plan for the employer to take some time from the new employee's first day to discuss, at some length, the nature of the work of each man who will work with or near the new employee. He could state what each man's job is, how it fits in with the work of the company, and a brief comment on the man himself. This discussion would clear up many hours of bad guessing, wondering, and false impressions. New employees who are uninformed regarding their fellow employees are likely to ask themselves, "I wonder what his job is? He never seems to be doing anything important"; or, "I know as much as that fellow, and he is a big man in this company." These ideas usually prove to be wrong after more is learned about the men, but as human beings are reluctant to admit their mistakes, the first impressions are hard to change. I found that I had guessed wrongly more often in my office job than when I was working in the laboratory.

IV

Usually the new employee is obliged to do work that he has never attempted before. This new application requires some degree of explanation and instruction from the employer and some thought by the employee. He has been anxiously waiting to see just what his job was to be, and after he has found out he immediately forms impressions of it. He wonders how interesting it will be and how he will like the work. Almost everyone makes up his mind immediately whether he will like a thing or not, and he usually sticks to his first impression. He wonders how difficult the job will be. I have noticed that jobs appear much more difficult when first viewed than they actually are after work is begun. The employee wonders how important his job is to the company. This is a very important item, because all men like to do something that is important and hate any job which seems very unimportant, or any job that apparently anyone could do. To think that one's job is not important may lead to carelessness and indifference toward the work.

Many jobs these days are routine or repetitive. Such a job discourages some men. They feel that they are capable of doing more complicated work. Because such a job requires less concentration, there is more time for other thoughts. Since most of a man's impressions are bad ones, the less time he has to form them, the better. In my job in the laboratory the work as a whole is routine and somewhat repetitive. However, I never felt toward it as I would toward ordinary routine work, for in the laboratory each man does a complete test by himself. He sets up his own apparatus and, aside from general specifications, carries out the test in his own manner. It gives a feeling that what one is doing is all one's own, and not a routine part of some previously planned job, in which the worker follows other's instructions. I think that a worker always feels better when he can call a job his own.

V

To perform a job, whether it be in an industrial plant or in a business office, one must use equipment of the company. Paper, pencils, tools, machinery, metal, wood, and other supplies are all placed under the heading of equipment. When the new employee starts to do his job, he comes in contact with this equipment. He is quick to notice any deficiencies, however slight, in the equipment. He notices the amount, the condition, the availability, and the quality of the equipment, and in the first week of his employment, he will base much of his opinion of the company on the equipment. I am inclined to think that the condition of a company's equipment is a fairly good way of judging a company. If a company is interested in the good will of its employees it will provide the equipment necessary to do a good job, and not expect a good job to be turned out with inferior tools. That applies as much to an office as it does to an industrial plant. From my limited experience I think that offices are far ahead of plants in providing up-to-date and adequate equipment.

VI

The final source of impressions of the new employee lies in the policies and methods of the company. A new man often hears much about these factors from other dissatisfied employees. If the newcomer is intelligent he will disregard these statements and wait to see for himself, for a dissatisfied employee is very likely to color his story with exaggerations. The attitude toward lateness, and absence, the granting of vacations, the salaries, promotions, and dismissals are all very important matters of policy which will come to the attention of the new employee before he is with the company very long. The impressions that he forms of these matters are the most important ones. They may easily cancel other impressions formed earlier. I realize that the question of policies of firms is an enormous one, and is well worthy of a separate report, so I will not attempt to cover the subject in this report.

CONCLUSION

We have discussed the different sources of impressions made during the first few days of employment. The question is, "What conclusions do we draw?" There seems to me to be one outstanding conclusion, and that is, if a company tried as best it could to analyze all the impressions of a new employee and then make the correct changes so that all these impressions would be favorable ones, that company would have made a great stride in the direction of reducing human relations problems. I realize that it would be quite impossible to make enough changes to favorably impress all new employees in all cases, but if the company would merely search for the outstanding causes of unfavorable impressions and remove them, they would greatly decrease their problems. A company should be concerned not only with the impressions of its employees, but also with those of the public.

I think that we can draw another general conclusion from our report: The new employee cannot help forming opinions, but he should be very careful that they are fair ones, not influenced by prejudices or other people. One cannot expect a company to remedy such problems; they can only be held responsible for impressions which were made fairly with facts as a basis.

Of course, the forming of impressions does not cease until after the employee has been working for some time. The first ones were made when little was known of the company. The later ones are made more slowly and with a great deal more thought behind them; they are no longer called impressions but are real opinions.

In my opinion there is only one universal cause for all human relations problems, and that is greed. No matter what cause is on the surface, greed is sure to be behind it. The desire to have more than the other fellow is inborn in the human race. It is the cause of human relations problems not only in industry, but also those in social life. It is the cause of corrupt politics, the cause of wars, and it is the reason there can never be a Utopia.

Comments by Professor Robert Widdop, Director of Industrial Relations:

Mr. Erdman is a Junior Electrical Engineering student at the Newark College of Engineering and had Honors standing through his sophomore year. This article is likely to be of interest to employers, particularly those to whom their relations with their employees mean a good deal. It is drawn directly from the author's summer experience in industry. It was required by the college that he have a working experience and that he report on it if he wished to continue in the Honors Option.

It is perhaps true, to a degree, that young engineers are open to the criticism that they are not as sensitive to problems of people living and working together as they are to problems of design or production, and throughout each of the four years the Newark College of Engineering has courses designed to increase the sensitivity of the student to the human factors. It is for this same purpose that a paper with human relations emphasis is required for Honors standing.

THE FACULTY

The faculty and instructing staff of the Newark College of Engineering now numbers 87 members. Included in the staff is the president, 10 professors, 9 associate professors, 16 assistant professors, 18 instructors, 12 assistant instructors, 11 departmental assistants and 8 special lecturers.

The table given below is interesting in that it shows the growth of the instructing staff during the last six years.

	1934 -35	1935 -36	1936 -37	1937 -38	1938 -39	1939 -40
President	1	1	1	1	1	1
Professors	8	8	9	9	9	10
Associate Professors	6	6	6	6	7	9
Assistant Professors	8	8	12	13	16	16
Instructors	13	15	16	20	20	18
Assistant Instructors	11	11	20	10	10	12
Departmental Assistants				11	9	11
Special Lecturers		4	6	5	7	8
Others	1	2	1	2	2	2
Total	48	55	71	77	81	87

ISOTOPES AS A TOOL IN CHEMICAL RESEARCH

By Joseph Joffe, A.B., B.S., M.A. and Ph.D.

Associate Professor in Chemical Engineering, Newark College of Engineering

While on the one hand the physicist has succeeded in synthesizing a number of radioactive isotopes of the lighter elements by proton, neutron, and deuteron bombardment, on the other hand the chemist is making important strides in separating or concentrating the stable isotopes of the lighter elements, such as H^2, C^{13}, N^{15}, and O^{18}. The radioactive isotopes can be detected, even when present in minute amounts, by means of sensitive geiger counters. The non-radioactive isotopes, when present in concentrations in excess of those occurring in nature, may be detected by means of density balances specially constructed for that purpose[1], as well as by other methods.

Isotopes are used increasingly in chemical and biological research. In the not very distant future applications will probably be found in the industrial field. It is, therefore, both of some interest and importance to the industrial chemist to acquaint himself with this new tool in its present stage of development.

Hevesy[2] in 1921 grew plants in solutions of ordinary lead, then transferred them to solutions of radioactive lead. The radioactive atoms were found to exchange places with the lead atoms in the plant. This was one of the first indications that atoms in a living organism are in a mobile state, continually exchanging with like atoms in the environment. More recent experiments with artificially created radioactive phosphorus show that a similar state of affairs holds in the case of animals. Radioactive phosphorus atoms, when introduced into an animal, exchange places with organically bound phosphorus in muscles, bones, and teeth.[3]

In 1933 when deuterium (heavy hydrogen) first became available for chemical research, Bonhoeffer[4, 5] dissolved sugar in heavy water and showed that those hydrogen atoms which are attached to oxygen atoms are replaced by deuterium atoms, while the hydrogens which are directly attached to carbon atoms do not exchange. It appears that hydrogen atoms attached to oxygen atoms in sugar ionize and mix with the hydrogen ions of the water. A number of other experiments indicate that hydrogen atoms attached to carbon atoms do not exchange directly with deuterium ions in the solvent, while the hydrogen atoms of the carboxyl, hydroxyl, amino, and aldehyde groups exchange readily and, hence, presumably, ionize in solution.[2] (See, however, the recent work of Bonhoeffer, Geib, and Reitz on the rate of ionization of the carbon-hydrogen bond.[6])

Halford, Anderson, and Bates[7] showed in 1934 that one of the hydrogens in acetone is readily replaceable by deuterium. The exchange takes place through the formation of the enol form, $CH_3C(OH){=}CH_2$, which has an ionizable hydrogen. Schwarz and Steiner[8] found that all six hydrogen atoms of acetone are replaceable with deuterium atoms. This may be explained in terms of repeated keto-enol and enol-keto transformations of the same molecule of acetone. In these experiments acetone was mixed with heavy water of known density, after a definite time the acetone was removed, and the density of the water was re-determined.

Other tautomeric changes, such as those which involve the shifting of a carbon double bond, were observed to lead to an exchange of hydrogens bound to a carbon atom. Hence, according to latest views,[4] the exchange takes place during the tautomerism process itself, a proton or deuteron attaching itself to the molecule in one position while a deuteron or proton is given off at another position by the ion formed.

The heavy isotope of oxygen, O^{18}, was used by Polanyi and Szabo[9] in determining the mechanism of the reaction

$$CH_3\overset{O}{\ddot{C}}{-}OC_5H_{11}+OH^- \longrightarrow CH_3\overset{O}{\ddot{C}}{-}O^- + C_5H_{11}OH$$

Water containing an abnormally high concentration of O^{18} was used for the reaction. The resulting amyl alcohol, however, had a normal isotopic composition. This result demonstrated that the OH^- ion reacts with the OC_5H_{11} group and not with the C_5H_{11} group. It also follows that amyl alcohol does not yield any OH^- ions, since then exchange with the OH^- ions of the water would take place.

More recently (1938) Cohn and Urey[10] have conducted qualitative experiments with twelve organic compounds with the aid of heavy oxygen with results which indicate that in general the oxygen of the hydroxyl group and the carboxyl group in organic compounds does not exchange with the oxygen in water, whereas the oxygen of the carbonyl group in both acetone and acetaldehyde does exchange. In the case of acetone the difference between the observed reaction rate and the rate of enolization of acetone indicates that, unlike the exchange of hydrogen, the exchange of oxygen does not take place through the formation of the enol form.

Radioactive iodine and bromine were used by Hughes[11] and his co-workers in confirming the mechanism proposed by Holberg to explain the racemisation of organic halides by halogen ions. According to Holberg the negative ion approaches the carbon-halogen dipole at its positive end, and the substitution results in an inverted product. A repetition of the reaction with the same molecule leads eventually to racemisation. Hughes was able to follow the rate of substitution by using sodium iodide containing radioactive iodine. The resultant radioactivity of the organic halide (sec-octyl iodide) could then be measured and the rate of substitution calculated. The velocity of substitution was found to be the same, within experimental error, as the velocity of racemisation. This result represents direct evidence in support of Holberg's hypothesis that the stereochemical inversion is produced by the substitution.

Steacie and Alexander[12] performed an experiment in 1937 designed to test the free radical chain theory of the decomposition of organic compounds. Deutero-acetone, in which all hydrogen atoms are replaced by deuterium atoms, was mixed with ordinary dimethyl ether and the mixture was decomposed at 590° C. If each substance decomposes by a molecular mechanism, the following reactions should take place:

$$CD_3COCD_3 \longrightarrow CD_4+CD_2{=}CO \longrightarrow CD_4+CO+\tfrac{1}{2}C_2D_4$$

$$CH_3OCH_3 \longrightarrow CH_4+HCHO \longrightarrow CH_4+CO+H_2$$

The hydrogen formed in the process should all be of the "light" variety. If, however, free radicals or atoms occur as intermediate products, a certain amount of "heavy" hydrogen gas would result, since the following reactions would be expected to take place:

$$CD_3+H_2 \longrightarrow CD_3H+H$$

$$CH_3+H_2 \longrightarrow CH_4+H$$

$$H+CD_3COCD_3 \longrightarrow HD+CD_2COCD_3$$

Steacie and Alexander found that only "light" hydrogen was produced in their experiment. These results make it improbable that either of the two decompositions studied proceeds by a free radical chain mechanism.

Trenner, Morikawa, and Taylor[13] studied reactions between atomic deuterium and saturated aliphatic hydrocarbons.

[1]See references at end of article.

They were able to calculate the activation energies of these reactions and deduced the bond energies of CH_3—H and CH_3—CH_3. The energy of the carbon-hydrogen bond was found to be 108 kcal., that of the carbon-carbon bond, 97.6 kcal.

Some of the more important research involving the use of isotopes has been summarized in this discussion. Recent issues of current scientific periodicals, such as the Journal of the American Chemical Society, the Journal of the Chemical Society, and the Journal of Chemical Physics should be consulted for additional examples of this type of research.

REFERENCES

1. Daniels: Chemical Kinetics, p. 254.
2. Krogh, Science, 85, 187 (1937).
3. Hevesy, J. Chem. Soc., 1939, 1213.
4. Bonhoeffer, Trans. Faraday Soc., 34, 252 (1938).
5. Daniels: Chemical Kinetics, p. 245.
6. Bonhoeffer, Geib, and Reitz, J. Chem. Phys., 7, 664 (1939).
7. Halford, Anderson, and Bates, J. Am. Chem. Soc., 56, 491 (1934).
8. Schwarz and Steiner, Z. physik. Chem., B 25, 153 (1934).
9. Wynne-Jones, Chem. Rev., 17, 115 (1935).
10. Cohn and Urey, J. Am. Chem. Soc., 60, 679 (1938).
11. Hughes, J. Chem. Soc., 1935, 1525; 1936, 1173.
12. Steacie and Alexander, J. Chem. Phys., 5, 372 (1937).
13. Trenner, Morikawa and Taylor, J. Chem. Phys., 5, 203 (1937).

Editor's Note:

Professor J. Joffe is a graduate of Columbia University where he received the degree of A.B. in 1929, B.S. in Engineering in 1930, M.A. in Physics in 1931, and Ph.D. in Chemistry in 1933. He is a member of Phi Beta Kappa and Sigma Xi. He has been teaching at the Newark College of Engineering since 1932. In 1933 he was appointed Assistant Professor, and in 1939 Associate Professor in Chemical Engineering.

CHANGES IN THE STAFF AT NEWARK COLLEGE OF ENGINEERING

On September 1, 1939, the following promotions became effective at the Newark College of Engineering:

Dr. Paul Miller Giesy, formerly Associate Professor in Chemistry, was appointed Professor in Chemistry.

Paul C. Shedd, formerly Assistant Professor in Electrical Engineering, was appointed Associate Professor in Electrical Engineering.

Dr. Joseph Joffe, formerly Assistant Professor in Mechanics and in Chemistry, was appointed Associate Professor in Chemical Engineering.

Frank A. Grammer, formerly Assistant Professor in English, was appointed Associate Professor in English. Professor Grammer was placed in charge of the Department of English.

Dr. T. Smith Taylor, who last year joined the staff of the Department of Physics to fill a vacancy, was appointed Associate Professor in Physics.

Paul O. Hoffmann, formerly Instructor in Mechanics, was made Assistant Professor in Mechanics.

William Hazell, Jr., formerly Instructor in Physics, was made Assistant Professor in Physics.

William Jordan, 3rd, formerly Instructor in Electrical Engineering, was named Assistant Professor in Electrical Engineering.

William Arnott, formerly Instructor in English, was given the title of Special Lecturer in Industrial History.

Frank A. Busse, formerly Assistant Instructor, was appointed to position of Instructor in Civil Engineering.

David E. Zeliff is on leave of absence for the present year, but he continues his work of instruction in Section 43 classes.

New appointments include the following:

Harry F. Ritterbusch, one of our graduates, who was previously a member of the instructing staff of Stevens Institute, has been named Instructor in Mechanical Enginering.

Roy Anderson and Jerome L. Polaner have been named Assistant Instructors.

Carl Konove and Frederick A. Russell have joined the staff as Assistant Instructors under a fellowship arrangement.

The following have been appointed Departmental Assistants:

David Donald in the Civil Engineering Department;

William P. Foster and Walter N. Waldau in the Electrical Engineering Department;

Walter R. Ernst in the Industrial Chemistry Department;

Bernard Gross, Albert Rosenfeld, and William Anderson in the Mechanical Engineering Department;

William F. Hummel in the English Department;

Robert Horrocks in the Industrial Engineering Department; and

Victor Pietrucha in the Physics Department.

ALUMNI

John E. Hanle, a graduate in Chemical Engineering with the Class of 1936, was recently appointed to membership on the Committee of Wood Finishing of the American Society of Mechanical Engineers.

Mr. Hanle has also been honored by election to active membership in Phi Lambda Upsilon, national honorary chemical society. This honor was won by Mr. Hanle last spring while he was taking graduate work at Brooklyn Polytechnic Institute.

CIVILIAN PILOT TRAINING COURSE

The Civil Aeronautics Authority has designated the Newark College of Engineering as a member of its Civilian Pilot Training Program. This program calls for the training of some 10,000 civilian pilots within a year. It is in no way connected with the Army or Navy; the program's purpose being to develop civil aviation.

The course, leading to a possible Private Pilot's License, consists of 72 hours of ground school work and 35 to 50 hours of flying. The ground school work consists of the following schedule:

History of Aviation	2 hrs.
Theory of Flight	15 hrs.
Civil Air Regulations	12 hrs.
Practical Air Navigation	15 hrs.
Meteorology	15 hrs.
Parachutes	1 hr.
Aircraft Power Plants	5 hrs.
Aircraft Instruments	5 hrs.
Radio Uses and Terms	2 hrs.

The ground school work will be given at the College. Mr. Robert N. Dobbins, B.S. in M.E., a graduate of the College in 1938, will be the instructor. Mr. Dobbins holds a government license as a pilot and as an instructor and is fully qualified to give instruction in this subject.

The flying part of the course will be given by the Unger Aircraft Corporation at the Westfield Airport. Their equipment and instructors are licensed and examined by the Civil Aeronautics Authority. The ground school work will begin on October 23 and the flying instruction will start about a month later.

The College has been allotted a quota of 20 students for this program. Each student must have his parent's consent to enter the course. In addition, he must pass a medical examination, first by the College physician, and finally by a physician designated by the Civil Aeronautics Authority. The selected students will be charged a fee of $40.00 for the course, the balance of the charges being met by the Civil Aeronautics Authority.

President Allan R. Cullimore has designated Dr. Frank D. Carvin, Professor of Mechanical Engineering, as director of the course. Professor Carvin will be responsible for the conduct of the entire instruction, both ground school and flying. It is anticipated that the course, as outlined above, will be repeated next year.

REGISTRAR'S REPORT

By P. L. Cambreleng, A.B.

Registrar, Newark College of Engineering

The classes which started the new scholastic year in September are well under way and an analysis of the applications for the freshman class is now being completed. Even at this early date, applications are being received from students who wish to enter in February and it seems probable that this year's February group will be of about the same size as those of previous years. It is possible that the high schools may discontinue mid-term graduations within the next few years and, of course, when that time comes it is probable that our February admissions will be discontinued also.

The procedure of interviewing all prospective freshmen which was inaugurated prior to the opening of the 1938-39 term was continued with this year's freshman class, which was selected from 408 candidates who submitted their applications during the past spring and summer. One valuable result of this interview was to eliminate at once those candidates who for various reasons were palpably unfitted to carry on the work of our courses. In addition, for those students who were acceptable, both the College and the individuals were aided by the additional knowledge gained of the physical condition, emotional stability and mental aptitude of the student. Through these interviews we have been enabled to present to first year men some facts concerning what their proposed study of engineering would demand from them and in turn what they might expect to obtain later in their professional life as engineers.

The following figures may be of considerable interest as an indication of the growth of the student body over a period of three years.

	Former Students	Advanced Students	Freshman	Total
1939-40	683	29	227	939
1938-39	609	14	206	829
1937-38	585	....	190	775

THE STUDENT ENGINEERING SOCIETIES

The Newark College of Engineering Student Chapter of the American Society of Civil Engineers held its first meeting of the year on October 9th. President Allan R. Cullimore addressed the Chapter on the topic: "The Future of Civil Engineering." The president said, among other things, that Civil Engineering is one of the best approaches to life, and that the young graduate should not be disappointed if he does not get into the work of his choice immediately, for the field is broad. The Chapter enjoys this annual contact with President Cullimore and to listening to his words of encouragement.

On November 13th, Professor Kissam of Princeton University will talk to the Chapter about the New Jersey System of Co-ordinates for Land Surveys.

Other meetings will be held on December 11th, January 8th, February 5th, March 4th, and April 1st.

(Reported by Professor William S. LaLonde)

The Newark College of Engineering Student Branch of the American Institute of Electrical Engineers opened the '39-'40 season on Monday, October 9, 1939. This year the local chapter is working in cooperation with the other colleges of the metropolitan district in fostering a student executive group. The purpose is to plan the general affairs of the metropolitan group in sponsoring the yearly spring convention. The local branch president, Mr. J. Burick, outlined the plans for the current season. The proposed metings include having industrial men discuss with us various electrical subjects such as power plant developments, illumination research and television.

After this general meeting the attending group of thirty-five men heard discussed some of the problems of the telephone lines. Mr. L. A. Hompesch, a representative of the N. J. Bell Telephone Company, demonstrated for us methods used in fault location and outlined the development of these methods.

(Reported by C. H. Stephans)

The Newark College of Engineering Student Chapter of the Society for the Advancement of Management held its first meeting of the college year on Monday, October 16th. The speaker, Mr. Alex Zuk, Time Study Engineer at the Westinghouse Electric Elevator Company, spoke on "Problems of a Time Study Engineer."

The officers for this year are: J. R. Birmingham, president; J. F. Daley, vice-president; and W. J. O'Connor, secretary and treasurer.

(Reported by Professor J. Ansel Brooks)

On November 10th the Student Branch of the American Institute of Chemical Engineers will hold its November meeting. Mr. H. C. Barnes of United States Industrial Chemicals, Inc., will talk on the manufacture of ethyl alcohol. Later in the season the chapter will make an inspection trip to the plant of this company to see the process in operation.

(Reported by Dean James A. Bradley)

WHAT OUR PROFESSORS ARE DOING

Professor S. Fishman of the Electrical Engineering Department, Newark College of Engineering, spoke before the electrical section of the Society for the Promotion of Engineering Education at the annual summer convention held this year at Pennsylvania State College. He described the Electronics course which is presented at Newark. In the discussion which followed there were several favorable comments.

"Dropwise Condensation of Steam on Vertical Tubes" is the title of a paper published in a recent number of the Transactions of the American Institute of Chemical Engineers. Sydney Baum, a graduate of the Newark College of Engineering with the class of 1935, is joint author of the paper with Professor W. H. McAdams of Massachusetts Institute of Technology and J. P. Fitzgerald of the Armour Institute. Mr. Baum and Mr. Fitzgerald both studied under Professor McAdams at M. I. T. where Mr. Baum received his Master's Degree. The paper was presented at a meeting of the Institute in Philadelphia last November. Mr. Baum is an assistant instructor at Newark now while taking work at Columbia leading to a Doctor's Degree in Chemical Engineering.

Dr. Frank D. Carvin, head of the Mechanical Engineering Department, was elected a member of the Executive Committee of the Metropolitan Section of the American Society of Mechanical Engineers. He is also chairman of the Program and Meetings Committee of the section, and as such, is responsible for some 90 technical meetings this winter. He is also chairman of the Heat Power Division of the Society for the Promotion of Engineering Education and chairman of the Educational Committee of the New Jersey State Industrial Safety Commission. In September of this year, Professor Carvin was retained by the Standard Oil Company of New Jersey to develop and supervise a course in Steam Power Plant Design for the employees of the Bayway Plant. The men taking this course are all college graduates and are employed in the various engineering departments of the company.

STUDENT INTERESTS AND HOBBIES

By Seymour Feder, *Junior*

Newark College of Engineering

It has often been said that four years of college will change a man's interests and feelings. Perhaps the fact that the student is in reality only a boy when he enters is responsible for the change since one's opinions alter with maturity. A general questionnaire has been circulated among all the students at the Newark College of Engineering this year and a survey of their interests and hobbies has been made. Some interesting contrasts are shown in the figures below.

The tabulations give the percentage of students who have various hobbies and interests in common with other members of the classes. The comparison is between the Freshman Class of this year and the Senior Class which is about to graduate.

	134 Freshmen 222 Hobbies	108 Seniors 228 Hobbies
Athletics	20%	17%
Photography	10%	10%
Stamp Collecting	8%	2%
Aeronautics	2%	2%
Amateur Radio	2%	8%
Model Building	6%	1%
Music Appreciation	1%	8%

Thus we see that the ratio of those partaking in athletics remains consistent at about one out of six. The student seems to give up stamp collecting and model building sometime after entering college but acquires an interest in amateur radio and music appreciation. First year students lose interest in reading, target shooting, taxidermy, archery, hunting, camping and astronomy as hobbbies. By the time he is a senior, he is engrossed in organization work, art, metallurgy, dancing, dramatics, time and motion study, and inventing. About one-half of the senior's hobbies are professional or otherwise technical, the other half being social or non-technical.

The upperclassman engages in a greater variety of sports than does the freshman. He learns to bowl, sail, play handball, shuffleboard, fence, play softball, and golf. The senior forgets track and how to play football, but learns to play bridge.

The Newark College of Engineering student comes here with 1.7 hobbies and leaves college with 2.1 hobbies, a gain of 24 per cent. His interests become more mature and of financial benefit as he advances in his professional courses. The student engineer has time for outside interests, even though his classwork is much more time-consuming than that of liberal arts students.

"N. C. E. MAGAZINE MADE PERMANENT

From SUNDAY CALL, Newark, N. J., Oct. 29, 1939

"NEWARK ENGINEERING NOTES, a magazine which has attracted international attention since it was first published exprimentally in 1937 by the Newark College of Engineering faculty, will be a permanent publication starting with its next issue. Its articles, mostly by faculty members, cover observations and results of original research in science and education.

"Its 4,000 copies go to alumni of the college, engineers, industrialists and libraries in nearly every state and some have been requested by individuals in China, Japan, Hawaii, Canada, the Dutch West Indies, South America, Puerto Rico, Sweden, Cuba, Mexico and Palestine. Nationally known 'digest' magazines and scientific publications have reprinted some of the articles. The large amount of 'fan' mail has surprised the faculty.

"The articles deal informally with subjects ranging from the most complicated practical engineering study to the foibles of freshmen. Professor Robert W. Van Houten is the magazine's manager and Professor Odd Albert, editor. Mr. Cullimore has a column, 'The President's Diary,' in each issue.

"Only faculty contributions appeared in the first few issues. Outside engineers and alumni began to send in articles covering interesting mechanical, chemical or mathematical discoveries made in their work.

"NEWARK ENGINEERING NOTES will be issued during the school year. Authors receive no pay and faculty members donate their services in its preparation. A few advertisements cover the printing cost and the magazine is free."

THE WESTON MUSEUM

By BEATRICE A. HICKSTEIN, B.S. in Ch.E.

When Dr. Edward Weston died some years ago he bequeathed to the Newark College of Engineering his entire library of more than 15,000 volumes, together with his scientific and technical apparatus and drawings, sketches and materials, which relate to his original discoveries and inventions. The bequest also included a sum to provide for the housing and maintenance of this material. For several years the staff at the College has been working on this collection. The books are being catalogued, indexed, and arranged on the library shelves, and the scientific apparatus is being checked and classified for the purpose of retaining a complete history of Dr. Weston's inventions and discoveries.

The creation of the Weston Museum is a result of the endeavor by the College to preserve for posterity the apparatus and materials of Dr. Weston. It is expected that some time in the future a formal opening will be held at which the general public and men and women well known in the scientific world will be afforded the opportunity of inspecting some of the early apparatus of the great inventor.

The museum is located in the northwest corner of the administration building of the college. A feeling of dignity and formality is created by long green draperies, indirect lighting, and walnut furnishings, which give an appropriate background to the remarkable pieces exhibited here. The cases are of walnut finished metal and were specially designed to house the Weston collection. Tables and chairs have been placed in advantageous positions around the room for the use of visitors and research workers.

When Weston first came to America from England at the age of twenty he worked for several years in the electroplating field which at that time was using batteries for power. He considered this method unsatisfactory and began working on the idea of obtaining power for use in electroplating from dynamos and soon began experimenting in and manufacturing them. While in this field he became interested in electric lighting as a use for dynamos, and worked for about ten years in this field. During his many years of experimenting Weston had found no electrical instrument which was accurate or dependable and so he was almost forced into experimenting with them if he was to continue his scientific investigation. This phase of Weston's life is by far the best known and we have in the museum many of Weston's early instruments, among them Model 1, No. 1, which is of the movable coil type. While working in the electrical measuring field Weston also brought out many regulators, switches, and safety devices for use in the electrical transmission of power.

The cases in the museum are arranged to make five units, each of which accommodate one of the above five phases of Weston's life. The phases are electroplating, dynamos, lamps, instruments, and electrical transmission of power.

Within each unit the exhibits have been arranged in a chronological order according to the time the piece was used or invented. On boards in the top and bottom of the cases some of the original Weston drawings refering to articles in the cases are mounted. Of particular interest are two drawings in color of the first Weston photometric bench in which he measured the candle power of a lamp against that of a candle and his later bench which measured the candle power against the standard gas flame. With these drawings are exhibited the apparatus used by Weston on the benches. The cards accompanying each instrument are being worded and arranged to appeal to, and enlighten, whoever might look through the museum, whether he be layman or technical man.

It is planned to have in one corner of the room a file containing all the available original drawings, patents, laboratory notes, and printed material that refer to the exhibits in the room so that the history of each piece can be traced by anyone doing research.

The museum is truly a storehouse of knowledge and every effort is being made to make this knowledge available to the general public.

WHAT OUR READERS SAY

To the Editor:

I recently saw the May copy of NEWARK ENGINEERING NOTES and saw therein reference to an article, "Ordeal of the Freshman," which I desire to read. Can you supply me with the March number?

If you can put me on your mailing list to receive future numbers of your publication it will be very much appreciated.

Very truly yours,
V. B. HALL,
Assistant Professor, Bucknell University.
Lewisburg, Pa., July 17, 1939.

To the Editor:

Will you please place my name on your mailing list to receive regularly NEWARK ENGINEERING NOTES? It is a grand magazine, and in addition to containing valuable information, it also keeps one posted on the activities of the school.

With best wishes for your continued success,

Sincerely yours,
C. A. RUSSELL,
Foster Wheeler Corporation.
Pittsburgh, Pa., August 8, 1939.

To the Editor:

Some time ago in one of your publications I noticed an article dealing with a new sodium storage cell which, as I remember, was advanced as a possible rival of the lead storage cell or automobile battery.

I would greatly appreciate your sending me a copy of this pamphlet of Newark Tech as well as any further information or references available regarding this sodium storage cell. I am particularly interested in regard to its construction and industrial applications, as well as the name and address of any company marketing such a battery.

Very truly yours,
KENNETH M. FOSTER, Ch.E.
Perth Amboy, N. J., July 9, 1939.

To the Editor:

I am a junior civil engineering student at the Agricultural and Mechanical College of Texas. Recently I came across a copy of NEWARK ENGINEERING NOTES and was intensely interested in the articles it contained. I would like to obtain more information about subscriptions to this magazine.

Thank you for your time and trouble.

Very truly yours,
CARL C. SCHNEIDER.
College Station, Texas, Sept. 14, 1939.

To the Editor:

Your letter of the tenth has spurred me to express the opinion I have had ever since receiving the first copy of NEWARK ENGINEERING NOTES.

I think this magazine will do more to educate the public in this section of the country as to what the Newark College of Engineering is doing than any other thing that has been done by the college in several years.

During the recent Power Show in New York I met several former classmates and in every case the first thing that was mentioned was NEWARK ENGINEERING NOTES. We are all of the opinion that it should by all means be continued and we are all very enthused about it.

I should like very much to write a paper to submit to you for publication but will have to give the matter some thought and will advise you in the near future.

Very truly yours,
G. G. COOMBE,
Stoddard & Livley.
Newark, N. J., June 13, 1939.

To the Editor:

We have been advised that the November 1938 issue of NEWARK ENGINEERING NOTES contained an article in referrence to a new battery which has been developed, and if it would not inconvenience you, it would be appreciated if you would send us a copy of this publication, inasmuch as the writer is particularly interested in articles of this type.

Thanking you for your very kind attention,

Very truly yours,
M. M. HATTEN, *Purchasing Agent*,
Electro Dynamic Works.
Bayonne, N. J., June 9, 1939.

To the Editor:

We very much appreciate receiving regularly since the early part of this year your NEWARK ENGINEERING NOTES. If you still have an extra copy of the November, 1938, issue, will you please mail it to me?

Yours very truly,
D. E. CABLE, *Librarian*,
United States Rubber Company.
Passaic, N. J., July 2, 1939.

To the Editor:

As per your offer in your publication, will you kindly place us on your mailing list?

I have just come across a copy of the December, '38, issue and would like to extend congratulations to Professor Albert on his article on Reinforced Concrete Beams. Very clear and concise.

Thanking you in anticipation, I remain, with best wishes for continued success,

Yours very truly,
DONALD PEGG, *Engineer*,
The General Construction & Engineering Co.
Newton, N. J., June 29, 1939.

To the Editor:

Please accept this belated acknowledgment of the receipt of the March issue of NEWARK ENGINEERING NOTES, which contains the article on Molecular Spectra by Dr. Carvin. This delay, I assure you, was not intentional—the issue was mislaid among some other periodicals which arrived at the same time, and did not come to light again until after the close of school.

I have read Professor Carvin's article with great interest and pleasure. He is to be complimented for having been so successful in presenting a rather complex though important subject in terms which can be comprehended readily by the engineer who has not specialized in physics. This illustrates, in my opinion, that a good teacher of engineering, by that very fact, is well fitted to be an excellent expounder of any non-engineering subject in which he may become interested. (May I say that I have been familiar with Dr. Carvin's ability as a teacher since the early twenties when, as a student, I sat in his classes at the University of Pennsylvania.) Professor Carvin makes it clear that he has not attempted to cover the entire field of Molecular Spectra; perhaps at some later date he will write and you will feel inclined to publish further articles on the same subject.

It would give me considerable pleasure to have my name placed on your regular mailing list. Again thanking you for the March issue, I am

Very truly yours,
A. W. DOLL,
Head, Dept. of Physics, Pratt Institute.
Brooklyn, N. Y., July 25, 1939.

To the Editor:

Will you please forward a copy of your monthly magazine, November 1938 issue, containing article on gear tooth design by Mr. Walter Larsen of Wright Aircraft.

Mr. Larsen is night school instructor in Dover and suggested writer apply direct to you for copy.

Very truly yours,
HAROLD P. FOOTE.
Rockaway, N. J., April 1, 1939.

To the Editor:

In looking over my old copies of NEWARK ENGINEERING NOTES I find that I have misplaced the last copy—that is the October copy, volume 2, number 1. As I feel that they are of great present value and will be of still a greater future significance, it is desirable to have all the copies. Would you please send me that last number if it is still available? I would gladly defray any costs.

Thanking you, I am

Very truly yours,
RALPH COHEN, '37.
Boonton, N. J., June 1, 1939.

To the Editor:

Kindly send me more information as to the necessary details to receive NEWARK ENGINEERING NOTES. I recently received a copy by mail and found it quite interesting.

Yours very truly,
E. E. HAGAN, *Supt. of Plants*,
Wailes Dove-Hermiston Corporation.
New York, N. Y., June 21, 1939.

WE CAST OUT 9's, OR 3's

(Continued from page 7)

Thus we have succeeded in not only showing that the check by nines is valid, but also that it is possible to check a sum by "casting out threes".

Our proof is not as simple as that which can be given by experienced mathematicians, but it was made without recourse to advanced algebra by simply stating in the mathematical language the facts which we knew from the beginning.

Comments by Professor James H. Fithian, Head of Mathematics Department, Newark College of Engineering

Mr. Easton's paper does more than give an interesting proof of the familiar rule of "casting out nines". It affords an excellent illustration of the use of "operators", where the mathematician, confronted with an inadequacy of the language of ordinary algebra, invents new operations and new symbols which enable him to proceed to the accomplishing of his purpose. Those of us who are none too familiar with operators and operational methods should find it enlightening and suggestive to read carefully the proof given in this paper.

E. C. Easton was born in Newark, N. J. He attended Lehigh University, receiving the degree of B.S. in Electrical Engineering in 1931, and the M.S. degree in 1933. During his last two years at Lehigh he held the James Ward Packard Fellowship in Electrical Engineering. During 1933-1934 he was engaged in research at Harvard University, to which institution he returns each summer to study the phenomena of electric arc breakdown. He has been teaching at the Newark College of Engineering since February, 1935. He is a member of Eta Kappa Nu, Sigmi Xi, and Phi Beta Kappa.