THE DUKE ENGINEER

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THE DUKE ENGINEER

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AN EXPLANATION . . .

By now "Button Freshman" must have taken on a familiar ring, and the intricacies and problems of our East Campus-West Campus arrangement have, we hope, been smoothed out. As Freshmen you've had your pajama parades, seen football games, and, in many cases, had your first Duke date. In short, you've passed your orientation period and are ready now to start out on four years of an engineering education and college life.

We think that you have weathered the storm well, and we take advantage of this issue to extend our congratulations. Throughout these pages we also hope to give you a "lead" on some of those Engineering societies, functions, organizations, --and professors--, that you're likely to run into during the next four years. We hope that these years won't evolve into four years of "all work and no play". If they do, they will lose a good part of their benefits. An education in itself is definitely important, but the knowledge and training acquired in normal college life with its activities will add immeasurably to the significance of a college degree. With the numerous activities offered by our Engineering College, we hope that you will all find some pie to stick your finger in, some activity that will bring you diversion and which will bring to Southgate added benefits.

You have all had an opportunity to see something of the workings of the Engineering Council and Engineers' Club, and we would like to acquaint you as much as possible with the formations and ambitions of these organizations. The Council is made up of four officers: President, Vice-President, Secretary, and Treasurer; two Senior and two Sophomore representatives; one Junior and one Freshman representative. The class representatives are elected by their respective classes; the officers by members of the Engineers' Club. The Club and Council operate as one organization with similar purposes and aims and with but one group of officers. The goal? To establish in Southgate a self-sufficient organization capable of handling all and any problems which might arise in connection with our Engineers. Naturally, to do this, we need the support of all the engineering students. As Freshmen, holding the majority of numbers, you can decide the success or failure of our attempts. We need your cooperation in ways too numerous and diverse to attempt to mention, but you'll see them cropping up from time to time. We hope and believe that, understanding our problem, you will assist us in giving next year's Freshmen even a better Southgate than the one you walked into.

Robert Perinovich

President of the
Engineering Council.

TELEVISION

6/11/41
Dr. R. L. Flowers
Donor

By Charles Parker
Senior E.E. Explains the intricacies of transmitting pictures by radio.

The dictionary defimes television as the transmission and reproduction of a view or scene by any device which converts light rays into electrical rays and then reconverts these waves into visible light rays.

Many ingenious devices have been invented in an attempt to instantly transmit a scene from one place to another, but most of them were partly mechanical, partly electrical, and had some major drawback. In fact, as recently as ten or fifteen years ago the problem of television was to produce a picture that could be recognized as such. Today the problem has become one of producing a high definition picture; that is, of improving the sharpness of detail, and of removing all trace of flicker in the motion.

The highest possible definition of a scene can be produced by a "camera obscura" which produces an image that is continuous over a two dimensional surface and in time. To obtain the same definition by electrical means is impossible, but by the sacrificing of some things in the picture the transmission of television can be accomplished. In the transmitting of television, advantage is taken of the fact that the human eye has two principle limitations; first, its ultimate finite resolving power and second, the persistence of vision.

If the picture or scene to be transmitted is reduced to a great number of dots or particles of various intensities the definition not seriously affected because the resolving power of the eye has been reached and the slight discontiniuties do not register. This phenomena can be illustrated by placing a printed page within reading range and then backing off from it. As the distance from the book increases it is noted that the type becomes indistinct and soon merges into a seemingly continuous gray surface.

In the process called scanning an exploring element travels over each of the above mentioned particles in some predetermined order, usually horizontally across one line of dots or particles, then down to the next line and across, and so on until the whole scene has been explored. The exploring element picks up and relays the intensity of each particle as it traverses this particle. It is during this scanning process that use is made of the persistence of vision. It is relied upon for the reproduced particles of the first line to still be retained by the retina of the eye while the last line is being explored. The best example of this is the moving picture, in which twenty-four individual pictures are flashed on the screen in one second. Because the image remains on the retina about one sixteenth of a second the second picture may be shown before the first has ceased to excite the eye. As each picture is of progressive action the effect is one of continuous motion. This is duplicated in television by scanning a scene thirty times a second, thus injecting the element of smooth continuous motion to the televised scene.

Figure 1 shows a functional representation of a television system. It is noticed that the exploring element and the reproducing spot move in exact synchronism over the entire area.

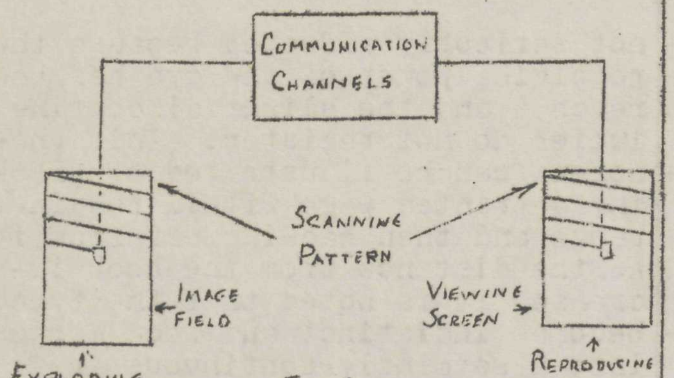


FIG 1

From the previous discussion it will be seen that there are four items of information to be transmitted from one point to another for successful moving image reproduction. They are: the two co-ordinates of area, time, and intensity. By controlling the horizontal and vertical motion separately, as well as the rate of complete scene scanning, the first three items of information are obtained without any connecting links between transmitter and receiver. From the above it can be seen that the intensity of each dot need be transmitted, which finally attains single channel transmission. Therefore only one path of communication is required between transmitter and receiver.

To understand better how these dots are recorded, transmitted, and reassembled to form a complete moving picture, the process will be described in reverse to first acquaint the reader with the optics of electronics.

The receiver tube, called a Kinescope, refer to figure 2, uses the fluorescence of certain chemicals under electronic bombardment to reproduce the dots that make up a scanned picture. An electron gun is placed at one end of the tube and supplies a copious stream of electrons that converge on a point at the front end of the tube. An electron beam has such properties that it may be deflected from its original path either by placing a magnetic field in the path of the beam or by placing a charge on a plate near the beam. As the electrons have a negative charge, a positive charge on the plates attracts the beam towards it. By placing one set of electromagnets or plates in a horizontal plane, horizontal deflection is achieved that is proportional to the intensity of the field, magnetic or electrostatic. By placing another set in a vertical plane, vertical deflection is realized. The electron gun is equipped with a grid that controls the velocity of the beam of electrons. The fluorescence of the material on the front of the tube varies with the mass-velocity of bombardment, and by controlling the velocity of the beam, the intensity of the flourescence is controlled.

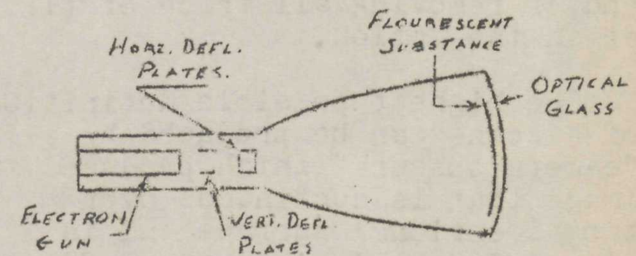


FIG 2 KINESCOPE

By moving this beam across the tube, the horizontal row of dots (usually, and hereafter called lines) are fluoresced into visibility. The beam is lowered one line on the next horizontal travel; that is, it is lowered one beam width, until the last line is reached, after which it returns to the top line and repeats the cycle.

The sweep voltages (the horizontally moving voltages taht move the beam.

tally and vertically) are supplied by oscillators that operate at a constant frequency and are in exact synchronism with the pickup scanning operation. The pickup or camera unit, transmits the intensity of each dot through a single linking channel.

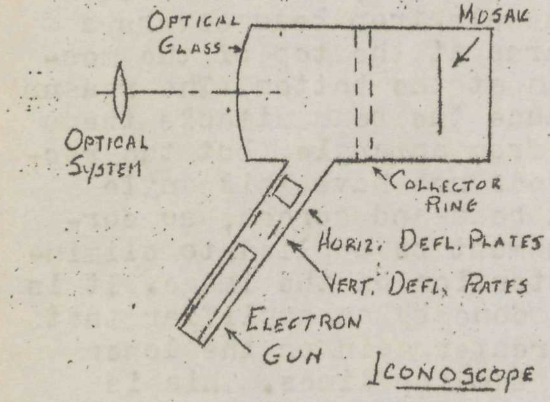


FIG 3

ICONOSCOPE

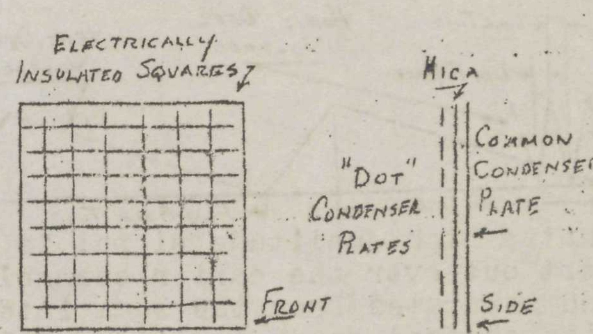
The camera tube in use at present is called an Iconoscope, refer to figure 3. It takes advantage of several electrical effects. The first is that light striking certain chemicals generates an electrical charge in proportion to the intensity of the impinging light. The second is the induction of a charge of opposite polarity on the second plate of a condenser when the first plate becomes charged. The Iconoscope contains a mosaic on which an image is focused optically by an external system of lenses. The mosaic, refer to figure 4, is a grid of small squares of silver coated photosensitive chemical. The squares are made one beam width to a side and mounted on a thin sheet of mica, which is backed by one metalic plate, which acts as the second plate of a bank of tiny condensors.

When light strikes each small square a charge is generated, inducing an opposite charge on the second plate, which is grounded and therefore connected to an infinite source of electrons and the charge does not affect the amplifiers at all. An electron beam, originating from an electron gun, similiar to that used in the above Kinescope, is caused to scan the bank of condensers (dots). When the electron beam strikes a charged condenser the charge is released to a collector ring that is connected to the input of the amplifiers. The beam scanning is accomplished as in the Kinescope. Thus the charge of each dot is released at the instant the Kinescope beam is on the corresponding dot in the receiver tube.

Since the magnitude of this charge, which regulates the intensity of fluorescence, is dependant on the original quantity of light reaching the condensor, the original image on the mosaic is reproduced.

This is basically all that is required for successful television, but as stated in the beginning it is no great problem to obtain an image resembling a picture, but it is a problem to obtain a high definition a great number of dots must

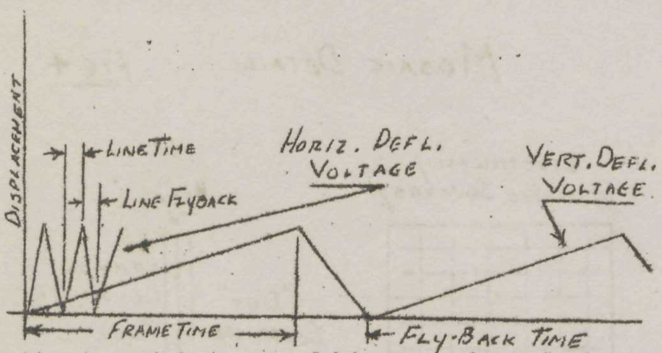
MOSAIC DETAIL FIG 4



be used. The Radio Manufacturers Association decided to standardize the experimental work to hasten progress, and finally agreed to use 441 lines to the picture, and 30 pictures, or frames, per second. Later this was adopted by the Federal Communications Commission as a requirement to obtain a commercial television transmission license. This means that 441 lines, or horizontal rows of dots must be used to each frame, and the frames must be scanned at the rate of 30/second.

The scanning oscillators that move the beam horizontally and vertically must be exactly synchronized as must be the beginning of each frame; otherwise the image would waver, twist and probably be off-center. The diagram (fig. 5) shows how these oscillators operate. The build-up voltages bear a straight line relation to time, providing a constant rate of displacement. The low frequency oscillator controls the vertical scanning by moving the beam downward 30 times a second. During each of these down movements of the beam, the beam has to move 441 times horiz- to cover all the lines, and this displacement voltage is supplied by the high frequency oscillator. It takes each oscillator about 15% of a cycle to return to zero voltage, and it is during these periods

TIME FIG. 5



that a high amplitude signal is sent out over the carier channel and separated from the beam intensity channel by an amplitude filter. At the end of each line a high intensity, low time length, signal is transmitted, operating a device which controls the horizontal sweep oscillator so that each line starts simultaneously on the camora and each of the receivor tubes. At the end of each frame a medium intensity , medium time element synchronizing signal locks the start of each frame of the camera and receiver together.

To prevent premature discharge of the condenser banks, the electron beam of the Iconoscope is biased to the cut-off during the flyback (that time during which time when the beam is returning to start scanning a new line or frame. The beam of the Kinescope is also biased to cut-off during these poriods to prevent light streaks on the picture.

From figure 3, it can be seen that the electron beam covers a wider area at the top of the mosaic than at the bottom. The reasmn is because the beam attacks the mosaic from an angle, but the receiver does not have this angle between beam and screen, so correction must be applied to eliminate distortion of the image. It is usually done by an amplifier that has a greater gain on the lower than on the top lines. This is called Keystoning and Keystone correction, due to the "Keystone" shape of the image without correction. The term coming from the architectural stone used in archos.

The Iconoscope is insensitive to average illumination but only records relative light. To compensate for this a photo-tube surveying the scene is connected to a circuit that raises the output level of the Iconoscope to the point where actual conditions are correctly identified.

All these corrections and synchronizers cause steadiness, low flicker level, high contrast, briliance, and a nearly continuous surface; which approaches the present day objectives.

Editors Note:-
Mr. Parker's article was presented aa a student paper at a meeting of the Duke University student branch of the American Institute of Electrical Engineers.

I I I I I I I

Prof. Seeley- "Did your roommate help you with this problem?2

Holley- "No, I got it wrong myself."

TACOMA BRIDGE

BY FRANCIS WERNEKE

SENIOR C.E. EXPLAINS REASONS FOR BRIDGE FAILURE

Probably the most talked about subject in the professional engineering world as well as in engineering classrooms in the past few weeks has been the collapse of the Tacoma Narrows suspension bridge at Tacoma, Washington. Before going into an explanation of this subject, I would first like to explain that I have had no experience whatsoever in the design or construction of suspension bridges and what I say in this paper has been the result of a recent study on bridges of this type.

EARLY SUSPENSION BRIDGES

The first suspension bridge ever built in the United States of any size was the Brooklyn Bridge across the East River in New York City. This was the first attempt at a large suspension type bridge. It was not until the construction of the Manhattan Bridge early in the twentieth century that the future of suspension bridges was realized. Many of the principles that were used in the construction and design of the Manhattan Bridge are still used in modern suspension bridge design. The Manhattan Bridge is important because it was proportioned and designed on the basis of the Deflection Theory. In otherwords, it was in the study of this bridge that it was clearly recognized that the deadload of a suspension bridge moderates to a very substantial degree the distortions of the structure under live loads. It was first thought that suspension bridges were very flexible and it was for this reason that stiffeners were introduced.

From a study of the Manhattan Bridge it was learned that trusses used as stiffeners had very little effect on the deflection of the bridge. This discovery made it possible to reduce greatly the depth of the stiffener, thus saving a great deal of material and expense. The ratio of the depth of a stiffener to the length of span in the Manhattan Bridge is 1/60, that is, for every 60 feet of span, 1 foot depth of of stiffener is required. As time passed and more suspension bridges were constructed, it became more apparent that the ratio of depth of stiffener truss to length of span could be greatly increased. In the Delaware River Bridge and the Bear Mountain Bridge the ratio is 1/63, in the George Washington Bridge it is 1/120, in the Golden Gate Bridge it is 1/168, in the Whitestone Bridge it is 1/209 and in the Tacoma Narrows Bridge the ratio is 1/350. One can greatly see the increase in this ratio as each bridge was built in succession. Probably the greatest advance in suspension bridge design was made when the George Washington Bridge was designed and constructed. The dead load of the George Washington Bridge is 39,000 pounds per linear foot. Through its design it was learned that the cable is the stiffest member of a suspension bridge. This discovery caused a great increase in the depth of stiffener trusses to span ratio. This great reduction in the depth of the stiffener trusses brought into play the use of plate girders as stiffening trusses. A plate girder has many structural advantages over a truss type of stiffener. The modern design of suspension bridges has decreased the importance of the the stiffener truss until now shallow plate girders are used extensively, and their main function is to distribute the live loads over a small portion of the span.

TACOMA NARROWS BRIDGE

The above theories and discoveries brings us up to the design and construction of the Tacoma Narrows Bridge at Tacoma, Washington. This bridge was designed by Leon S. Moisseiff, and into the design of the bridge went all the theories about suspension bridges and their design which had been advanced in the last 40 years. Now why did the bridge fail? It was built to standard specifications and its construction was acknowledged by prominent leaders in suspension bridge design. Was the theory behind the design all wrong, or did the collapse result from forces that were heretofore ignored? The latter seems to be the general concensus of opinion.

The Tacoma Bridge was opened to the traffic in July 1940. It was constructed at a cost of $6,400,000, weighed 6,000 pounds per linear foot, was 39 feet wide, had a main span of 2800 feet, and two end spans of 1100 feet each.

Immediately after the bridge was completed and for some time during the latter part of its construction, the bridge had a great deal of vertical wave motion. The intensity of of this motion was not proportional to the wind velocity. Sometimes a wind velocity of only four miles per hour would set up a great deal of wave motion, while at other times a wind velocity of 32 miles per hour would have little or no effect on the motion. These wave motions caused no damage to the bridge, prior to the collapse, except to be very disturbing to the traffic. At times a smooth, but very uniform wave motion of as much as 50 inches in amplitude was observed. Due to the disturbing effect this wave motion had on traffic, an effort was made to try to control it.

ATTEMPT TO CONTROL WAVE MOTION

Prof. F. B. Farquharson of the University of Washington ,had been conducting experiments on a model of the bridge in an effort to try and find a solution to the wave motion. The model is 54 feet long, and it was built to a scale of the ratioof 1:100. Electromagnets were used in place of wind pressures to to apply vertical and horizontal forces on the model; it was found that the actions of the bridge could be exactly duplicated on the model. Prof. Farquharson also ran wind tunnel tests on the model. Farquharson learned from his tests on the model that the structure was aerodynamically instable only when the wind was perpendicular to the bridge. This accounts for the fact that the amplitude of the wave motion was, at times, larger for a wind velocity of four miles per hour than it was for a wind velocity of 30 miles per hour. Through his experiments, Farquharson learned that the desired stability of the bridge could be obtained in either of two ways- (1) by the use of some form of deflector vane attached to the front of the stiffening girders, and (2) by making holes in the webs of the girders to allow the wind to pass through. The degree of stability could be governed by the shape and size of the deflectors and by the size, number, and location of the holes.

A month or more before the bridge collapsed it was known that the Tacoma Bridge was aerodynamically instable, and ways had been devised to check this instability, but the bridge collapsed while a decision was pending. Why wasn't immediate action taken?

DEAN HALL'S PAGE

ENGINEERING AS A PROFESSION

A prominent engineering educator has recently said that: "Engineering is the art of putting scientific knowledge at work on projects intended to benefit mankind. It is, therefore, a profession devoted to the application of the laws of such sciences as physics, chemistry, thermodynamics, and mechanics to the design of all sorts of structures, machines, and industrial plants: to the development of production processes; and to the operation of industrial plants. Engineering includes also the sale and distribution of industrial products and services and the organization of the human effort required in all of these activities."

This probably sounds like "quite a mouthful", and that is exactly what it is.

As freshmen just beginning your training for your life's work, you are probably asking yourselves many questions about the field which you have chosen. Detailed answers will come only during the rest of your life--with experience. The general answers lie in the above definition.

In examining this definition, we discover first of all, that engineering is a profession--it has ethics: principles of conduct which take into account our fellowmen. This makes an engineer, of necessity, an individual who knows how to get along with other people. To do this successfully, an engineer cannot be simply a technician; he must be able to meet other people on their own ground--to talk with them convincingly, and understand their viewpoints and problems.

This means a broadness of view requiring a rounded education. It means a good command of the English language, both written and spoken. It means that his character and personality should be two of his greatest assets.

Next, we find that the primary function of engineering is making the laws of the basic sciences useful to mankind. Your freshman courses in chemistry, physics, and mathematics are the foundation of your entire technical education.

Lastly, we see men with engineering training engaged in a a wide variety of activities, depending upon their individual abilities and interests: uncovering new scientific principles through RESEARCH, the DEVELOPMENT of these principles to make them useful, the DESIGN of useful products based on this development, the MANUFACTURE of such products, the SALE of these products in a competitive market, and the MANAGEMENT or DIRECTION of all of the activities just mentioned. Engineering is a broad field.

To be successful in any phase of engineering activity, a man must have had thorough training in the fundamental.

OUR ACTIVE ENGINEERS

Just to prove that Engineers are not all drones, here is a list of activities participated in by a few of the upperclassmen...

The members of the Engineering Council are:

President- Bob Perinovich
Vice-President- Bill Griffith
Secretary- Dale Myers
Treasurer- Dan Brandon
Representatives- George Kelcec, Chuck Holley, Dick Beeson, Tom Miller, Ted Stephens, Cecil Lucas, and John Carr.

Presidents of the societies are:

A.S.C.E. - Dutch Werneke
A.I.E.E. - Jim Highsmith
A.S.M.E. - Hugo Phillips

Outstanding in sports are:

Football- Pete Goddard, Charles Hipp, Clair Marsteller, and Ralph Morgan.
Basketball- Chuck Holley
Soccer- Rodney Johnston
Wrestling- Cecil Lucas, Dick Wilbur, and Bill MacLaughlin.
Swimming- Sandy Johnson
Cross Country- Phil Munroe, Dick Beeson, and Art Droge.
Freshman Basketball- Bill Wetmore (Captain)
Freshman Swimming- Bill Marshall (Captain)
Tennis- Tom Olson

Others of note are:

Intramural Manager- Chuck Hanson
Chanticleer Head Photographer- Doug Hege

In addition, there are Engineers in the Band, Glee Club, Choir, and other activities. So you see, the Engineers DO get around.

IMPROVEMENTS IN "SHACK"

There have been many improvements made to Southgate since last spring.

The most significant of these has been the assignment of two housemasters, instead of one, as formerly, one each on the second and third floors. These men are here to help students with all their problems while here at school.

Our gym has been repainted, and a handball court installed, simply because the administration felt that there was enough interest being shown toward intramural sports to warrant this addition.

The dining room has had a partition built into it, and the walls have been soundproofed to eliminate some of the superfluous noise in the all-important room.

The reception room has been improved considerably by our purchase of a new radio, and the addition of the trophy case.

Then too, new locks have been installed on the doors of our rooms and closets. Each of the occupants of the room has a key to the main door and this key will also fit one of the closet locks. Thus, much of the trouble that has arisen in the past, because of faulty locks and doors, will be eliminated.

All of these improvements are for our benefit, fellows, so let's all get behind the administration and those who are trying to help us, and back them to the utmost.

* * * * * * * * * *

A smile is a thing of immense face value.

- Pollard

CAMPUS NEWS

ACTIVITIES OF ENGINEERING SOCIETIES

The Student Branches of the Technical Societies

For the benefit of those Freshmen and upperclassmen, who do not know what the purposes of the three technical societies, the American Society of Civil Engineers, the American Institute of Electral Engineers, and the American Society of Mechanical Engineers are, we take this opportunity to explain their relative importance as a supplement to our engineering curriculum. First, the societies add to the students acquaintance with the practical side of the three fields of engineering.
Second, they furnish the students with technical information and the progress of today's engineering through their various monthly periodicals. Third, and perhaps the most important to any engineering student is that it helps to develop the students ability to speak in public and to familiarize himself with the parlamentary procedure carried on in all learned organizations. Finally, as do all fraternal societies; the American Society of Civil Engineers, the American Institute of Electrical Engineers, and the American Society of Mechanical Engineers help him to come in contact with men engaged in modern engineering practice and to prepare his future by following up these contacts.

Most of the Freshmen have in the past had the idea that these societies are for upperclassmen only. Although usually most of "the engineers" do not join these organizations until their Sophomore and sometimes their Junior years, it does not necessarily intimate that the Freshmen are not invited to come to the meetings of the respective societies to hear the various speakers that they have during the year. There is a standing invitation for all you fellows to come to the society meetings.

A.S.C.E.

On Tuesday night, October 15, the local student chapter of the A.S.C.E. held their second meeting of the year.

Bob Perinovich took honors for the evening by giving an interesting talk on the Pennsylvania Turnpike. "Peri" worked on the speedway this past summer making yardage estimates for N. L. Teer, a local Durham man who had contracted for three miles of the Everette section of the highway and therefore was able to divulge a lot of facts and figures on the construction and performance of the highway.

A.I.E.E.

At a meeting of the Duke student branch of the A.I.E.E., Mr. Guy H. Bennett, Distribution Engineer of the Durham Public Service Company, spoke on his work with the company.

He outlined the various departments of his company and briefly told of their duties in connection with the running of the entire company.

Of more interest to the members, however, was his description of the engineering department. The startling fact was pointed out that engineers would be employed in one capacity by the company and they would finally end up by being a salesman, a chemist, or even the head of the ice plant.

Mr. Bennett devoted the main part of his discourse upon the human side of engineering. He said, "To be a good engineer one has to know engineering and how to deal with the public." He amplified this statement by explaining that his company must keep their finger on the pulse of the public, To do this their engineers are strongly urged to join many clubs. An engineer cannot join such organizations as the Lion's Club, Foremen's Club, and the American Institute of Electrical Engineers without knowing how to conduct himself properly in public or to make a speech. The day is gone when the engineer was a rough, tough man who murdered the King's English. The modern engineer is equally at home in the drawing-room or behind the drafting board. His advice is to take advantage of all the English and public speaking courses possible.

Anyone dealing with the public must necessarily be a salesman; he must sell himself to his company and keep them sold. His parting advice was: "Be as human and as sympathetic as possible in your business dealings."

A.S.M.E.

At a regular meeting of the A.S.M.E. on October 2?, Professor ?.J. Seeley of our own faculty spoke on the technical problems of good broadcasting.

There are some forty-seven million receivers in use in this country and eight hundred and sixty two broadcasting stations, but there are only ninety-eight places on the radio dial for radio stations. Under these conditions there is bound to be much interference between stations on the same wave length. This is especially true of close and powerful foreign stations such as those of Mexico and Cuba. In fact there are only seven "clear channels", channels with only one station such as WLW. In order to cut down on interference the Interstate Commerce Commission is going to reallocate seven hundred and seventy-seven stations.

There are also many problems confronting the radio engineer in obtaining the correct modulation. Many changes take place in a sound wave between the time it is uttered into the microphone and the time it comes out of the speaker on a receiving set. Each sound requires a definite amount of energy. For example, the sound "th in the word "thigh" requires the least amount of energy and is therefore rated as one. Average conversational tones relatively require an energy rating of about twenty thousand. The "aw" in the word "awful" requires the greatest amount of energy and has a relative rating of four million. Musical Instruments are rated similiarly with a maximum rating of twenty million. The human ear can detect a range of from one to ten billion. This produces several separate problems for the engineer. First they must limit the volume range over the system. For example: from New York to Durham there is a range of from one to one thousand. The second problem is a matter of frequency. With music, it is concerned with pitch. The Bureau of Standards, therefore, has on the five thousand kilocycle band the musical pitch "A" sounding continuously so that one can tune an instrument at any time. Intelligible conversation must occur on a frequency range of from ninety to ten thousand cycles.

With all these problems it seemed that the only solution would be to tear out the whole system and start over again, but recently a new system of frequency modulation has appeared. Instead of using

(please turn to page 19)

C. E. Trip to Greensboro

On October 27, the "Civils" were fortunate in having a chance to go through the Carolina Steel Company's fabrication plant. About twenty men made the trip to Greensboro and were taken on an inspection trip of the plant, starting at the receiving end and finishing the tour at the point where the fabricated material was painted and made ready for shipment.

Of special interest to those attending were the variety of cutting and punching machines that were used. Irregular cutting was done by acetylene torches, while regular or straight cutting was done with circular steel saws or huge shears.

Rivet holes in small members were punched by a press which had a large flywheel to supply the sudden demand for energy when the shearing resistance of the steel was being overcome. Cardboard patterns were used and could be used over and over again should there be need for many duplicate members. In case several long beams were needed which had identical rivet patterns, duplication punching machines were used. A member was first made up as a pattern, then the rest could be punched without first marking out the rivet scheme.

Special interest was given to the skill of the riveters. The rivets were heated to the proper temperature in an electric furnace, the heat being produced by passage of the current through the rivets. A voltage control provided the operator of the furnace with a means of varying the current with different sized rivets.

The students were fortunate in being able to see a wind tunnel, which was being built for Langley Field in Virginia, under construction. Some discussion was held as to the best means of transporting such a large structure. The guide said that the tunnel was first to be erected at the plant, there dismantled and transported on trucks.

As the group was leaving the plant, mention was made of the availability of jobs in the fabrication industry and steel industry as a whole. The opinion of the guide was that the field was open and offered a young, inexperienced engineer a chance to get some experience but promotion was unlikely.

E. E. Trip to Charlotte

On October 30, the North Carolina section of the A. I. E. E. held its semi-annual meeting in Charlotte. The Duke University student branch was represented by the Electrical Engineering faculty and fifteen junior and senior students.

A short business session was held in the morning at the Hotel Charlotte. The members motored to Cliffside where they were the guests of the Duke Power Company at a luncheon and an inspection of the new Cliffside steam-electric power plant.

This plant was of particular interest, since it incorporates the latest and most efficient equipment. The generating machines are two General Electric 40,000 Kw. (at 0.8 power factor), hydrogen cooled, alternators. These units operate at 3600 rpm. and are powered by steam turbines. The plant is unusual in that it has no curtain wall between the turbine room and the boiler room. The ultimate capacity of the plant will be 240000 Kw. The group made an inspection of the entire plant and sub-station under the guidance of the plant employees.

A banquet was held in the Hotel Charlotte that evening. The speaker of the evening was Mr. H. R. Dwire. This banquet concluded the A. I. E. E. meeting.

The Duke students prolonged their visit on more day and visited the Bell Telephone Company plant the next morning. The operation and methods of the company were explained to the students.

That afternoon the Duke delegation went to the Buck steam plant of the Duke Power Company near Salisbury. Here construction of two 40,000 Kw boilers was going on, preparatory to installing an 80000 Kw turbo-generator. The part of the plant under construction was exceedingly interesting due to the unusual opportunity of observing the equipment before it was completely installed. After this tour of inspection the students returned to Durham with a quite complete knowledge of power plant construction.

M.E. Trip to Lake Michie

On Saturday, December 7, twenty four of the junior Mechanical Engineers under the direction of Mr. Theiss went on an inspection trip of the Durham Hydraulic Pumping Station located on Lake Michie. The juniors examined carefully the three generators, the hydraulic pumps, the turbines, and a few even went so far as to give the dam at the station their personal investigation and approval.

The dam, made of concrete, is 90 feet high and 550 feet long. It holds back an 80 foot head of water, and sends this water to a reservoir which is located near our College of Engineering. The students learned that when there is an insufficient head of water, the water was forced through the turbines by two hydraulic motor-driven pumps.

To show Mr. Theiss how eager they were to learn, some enterprising junior s climbed the side of of the dam but found a huge fence barring their approach to the top. Nothing daunted, they discovered a rowboat on the Lake shore and continued their personal inspection of the dam.

The trip was very successful as it gave these juniors a chance to see just how the theories of hydraulics, of which they are now studying, were put into practical application.

DO YOU KNOW--

Back in 1873 the Bureau Chief of the Patent Office in Washington tendered his resignation. There was no longer any need of his services, he said, as man's ingenuity had been exhausted.

A Crow Indian never converses with his mother-in-law. It's a tribal custom for avoiding possible family conflict.

A new type of tube called the "Klystron" tube transmits electrical power through the air.

Among the Aranda tribe of Australia, says a prominent anthropologist, a man is ordinarily expected to marry his mother's mother's brother's daughter's daughter.

In 1904 when the Southwark, London, Council discussed the desirability of advertising for a chief electrical engineer, an alderman said that "any person of ordinary intellegence could read up in a month all that an electrical engineer knew. It was all a lot of theory. What they wanted was a good mechanic to supervise the station."

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He has a physique like a Mexican. Every time he wears a belt his stomach goes south of the border.

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Women may not have more backbone than men, but they certainly show more of it.

OUR FACULTY

THE HEADS OF THE DEPARTMENTS:

PROFESSOR W. J. SEELEY

In the next four years the class of '44 will hear much about one of our brilliant men in the Engineering College. This man, Professor W. J. Seeley, known as "Pop" to the upper classmen, has a very interesting background, a background that any one in his postion would look upon with great pride. He graduated from Brooklyn Polythenic Institute with an Electrical Engineering Degree, just in time to enter the World War. During his enlistment, he was promoted from a First Class Electician to an ensign in the Navy.

After the war, he went back to school and obtained his M. E. Degree at the University of Pennsylvania. After graduating, he became an instructor at Pennsylvania; and during that time he also became the Street Lightning Engineer for the City of Trenton, His next job was in thecapacity of Consulting Engineer for the Lafax Company, makers of radio equipment. After working for many other concerns, he was appointed head of our Electrical Engineering Department. He also became President of the Duke Chapter of the A.I.E.E. as well as serving on the Executive Committee and being Chairman of theNorth Carolina Section. He also belongs to the American Institute of Radio Engineers, the Society for the Promotion of Engineering Education, theA.A.U.P. , S.P.S., P.M.E., D.E.S. and O.D.K. Professor Seeley has not limited his engineering knowledge to only his classes. He has written a laboratory manual, Impedance Computing Tables, and many articles for the engineering periodicals.

His strange , but interesting hobby consists of keeping a record of all the deaths in North Carolina caused by lightning. From these statistics, it is found that an average of twenty-one people are killed each year in North Carolina by lightning.

From this short description of Professor Seeley's life, you can see that he loves his work; in fact he is so interested in his work that his enthusiasm is contagious to his classes.

PROFESSOR R. S. WILBUR

Perhaps the best way to begin this article is to give a brief history of Professor Wilbur's life up until the time he came to Duke. He was born in Cohasset Mass. Dec. 6, 1884 graduated from Tuft's College in 1904 with a B.S. in M.E. He was He was married in 1918 to Elizabeth Ellen Lynch of Petersburg Va. They have three sons one of whom is a senior engineer at Duke at the present time.

After he graduated from college he started working as a steamboat oiler and tender. From then on he worked as a draftsmen and test engineer until he entered the the Teaching profession. He has taught at the Universities of Pennsylvania, iowa and Lafayette and finally came to Duke in 1933

Probably the first contact that a mechanical engineering student has with him in class is in the junior year, either in hydraulics or thermodynamics. Of course, if he doesn't happen to get in to one of his sections, his early training in art appreciation is postponed.

until the second semester of his junior year when he is sure to have him for I. C. E. and here he begins to appreciate the rumors that he has heard about Professor Wilbur's drawings on the board. He holds the title of being the Rembrant of Branson, the only man who can fill four blackboards with sketches of manifolds, valves, pistons, and carburetors and at the end of the period have the room look like it had been hit by a blitzkreig of chalk.

Although the student may be somewhat befuddled by his drawings he will never find a teacher who is more adapt in drawing anologies between problems that are encountered in class and everyday happenings in life.

He is a man liked well by every individual that comes in contact with him. He is never too busy to see you and talk to you about anything that happens to be on your mind. The efforts of Professor Wilbur have played an important part in securing for the College of Engineering the important place that it holds not only as a part of Duke University but also in the engineering world.

His many activities are further emphasized by the fact that he holds memberships in the following societies and fraternities; A.S.M.E., Society for the Promotion of Engineering Education, American Society of Naval Engineers, American Society of Professors, Delta Epsilon Sigma, Sigma XI, and Phi Mu Delta.

PROFESSOR HAROLD C. BIRD

If any of the students should happen to see an erect, military appearing person striding around the campus as if he hadn't a thing to bother him, the student might exclaim, "What a cheerful and happy man."

Perhaps this would stand as an introduction to Professor H. C. Bird. The ever present twinkle in his eye and his ready wit keep his classes far from being boring.

Professor Bird graduated from Yale in 1908 with the Ph.B degree, there receiving honors for excellence in all subjects. He returned for a Civil Engineering Degree in 1911 and then immediately started as an assistant professor in C.E. at Penn. Military College. He remained at this locality for twelve years when he accepted a position in an engineering firm. He came to Duke in 1926 and has been chairman of the Civil Engineering Department for twelve years

Professor Bird has two sons and one daughter. One of his sons, Jack, is a graduate of Duke. It is easily seen why he can be sympathetic with the students problems.

Professor Bird's military, free swinging style of walking can be accounted for by the fact that he is a captain in the R.O.T.C. His most amazing ability can be demonstrated in his strength of materials class--- while the students are laboriously calculating bending moments of a loaded beam on their slide rules, Professor Bird is cheerfully jotting down all the solutions which he mentally calculates before the fellows even get started. He then proceeds to ask if the slide rules are stuck.

His classes are looked forward to also as he is a master at mixing his cheerful banter with the instruction which tends to keep his classes on their toes.

Professor Bird is well known throughout his profession and his many activities include membership in the A.S.C.E., Society of Engineering Education, Concrete Institute, Railway Engineers, and others.

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Famous last words:
But chief, it wasn't my fault the bridge caved in. I thought that fly-speck was a decimal point.

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SPORTS

Each year brings new glories to the "Shack" in this field of extra-curricular activities, and makes the "Pansy-Village-ites" think twice whenever they meet us in combat. The Intramural season has started with a bang and it's up to each and everyone of you to make this bang into a resounding roar. Last year we suffered most of our defeats at the hands of the Sigma Chis', but at whose expense we won the University Basketball Championship. We should all be out to avenge these defeats this year.

For the benefit of the new men who have come to carry on the 'esprit des corps", let's take a look over the situation for the coming year. Football, fall tennis and fall handball have already started their gradual process of elimination to determine the worthy victors. Following these in season will be basketball, volleyball, swimming, boxing, wrestling, track, cross-country, badminton, baseball, spring tennis, spring handball, and horseshoes. Football, basketball, volleyball and baseball are sports that we participate in as a team or teams depending upon the amount of available material. All the other sports are classified as individual participation unless it is deemed necessary to enter a t team.

The Engineer's Club finances the various team sports, while each individual who enters any other sport does so at his own expense.

Let's get out there this year fellows and <u>show the West Campus</u> as we have in the past, that we're on the map and something to reckon with. However, always remember you're a great sportsman, win, lose, or draw, and make your cry "On to Victory" for the glory of the College of Engineering.

SOCIAL

The engineers at Duke University are planning a new future in social entertainment. Heretofore, each social event was an individual and segregated part of an uncoordinated social calendar. This year, however, a social chairman has been selected to coordinate the separate social events and to add and subtract such events until a well rounded and rather full program has been mapped to cover both semesters.

The social year started on Oct. 5th when the freshmen were given a chance to meet the faculty at a Smoker. Cigars and cigarettes disappeared like magic as did the "cokes" and cookies which were served as refreshments while the faculty held up their end of the occasion very well by delving into their never empty bag of strange experiences.

The Open House has, in the past, been cuite a sucess as a social event among the engineers. The Duke-Tennessee game presented an excellent opportunity to continue the successes. The freshmen engineers turned out in fine numbers and spirit.

Probably the climaxing social event for each semester is the Engineer's Ball. The date, the motif for decoration, and the orchestra have been decided. Due to the house-cleaning given the gym during the summer, it will not be necessary for the majority of the freshman class to stay up all night the night before the dance in order to complete the decorations.

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Febuary First Frosh telephone conversation:- "Hello Pop, guess who just got kicked out of college"

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THE DATA SHEET

Here we are with a few calculations on our engineers experiments in the field of uxurism.

Celery stalk of the month goes to Cobina and "Chuck" Holley- What a combo.

"Chuck" Hanson giving Bean a little competition in town.

Al Hunter giving the campus the go-by; his "Light of my life" now comes from town.

Uncle Ernie's car still spending its time in back of the Faculty Apartments.

Johnson dating Cumming's girl.

Gib Larson's brother giving him some competition.

Weston in the hospital-Wagner and Wall also.

Hugo still bats .1000 in Millie league.

Hastings at two dances.... Tch, Tch, George, and stag too-

And whats this about Robinson and the Pinehurst Golf Course. Maybe it's better than Hillendale.

We wonder if Margaret knows about "Mule Face" Webb's date with a cookie from Pitt for Southgate's Thanksgiving Dinner Dance.

Jim Barrow gives the East Campus a break.

Schoonover still trying to find gold in the library.

We three... Smoky, Doris. and ??? Could it be one of those laundry bags?

Blind dates or not, Giles is the place for Tom Miller.

And 8.5 Andrews telling that he stayed in the bus station in Raleigh from 1 'til 4 on a certain Monday morning. That ain't the way I heard it.

Schlerf getting off the beaten track and turning up in Brown-'smatter, did she move Don?

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From a church signboard:
Evening Subject
"What is Hell Like?"
Come and hear our organist

Citadel Engineer

Wonder why the Editor is in a stew- could it be one date a week?

Goddard, Hipp, and Marstellar tripling. Looks like the Football team is cooperating at last.

Stivers getting the rush from Marshall on the air but his heart belongs to Jennie.

"Baby Face" Dorton getting publicity on the local platter program. "Baby Face" says it's one sure way of letting people know you're around.

Walker moving into Giles when when things got stale at home.

Bradley playing safe and still going to dances stag.

Myers still looking of the right "amorita" in town.

Guppie and Dottie still on the upbeat.

Creamer and Morrison are like the famous Finnegan.... Off again, on again.

Wonder how "Wah hoo" Alpert and his squaw are doing.

Clous finishing off his college career as a playboy, and is he going to town.

Laros, Gingher, and Mac Masters still holding out on the East Campuss.

Have you noticed C. Hunter singing "Who is Judy, What is She?"

Tuten still holding his own with ?????

"Superwolf" Parker even wanting to take B.T's bate home after the dance.

The Engineering steadies- Don and Marie- Was the homecooked Thanksgiving dinner good?

Wonder why they're calling Werneke "The Picnic Kid?"

Wonder why Marshall stayed in the hospital after Tuesday? Could it be he expected Hazel of Rinaldi'S

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J.S.- "Do you want to see where I was operated on?"
C.H.- (eargerly)- "Yes."
J.S.- "Well, we re just two blocks from the hospital."

Old Line.

DEAN'S PAGE

(continued from page 9)

sciences and their application to the problems met in practice. Your curriculum at Duke is designed to provide this.

Every member of the faculty is interested in seeing that each student obtains the maximum return from his training here at Duke. Occasionally personal problems or difficulties in adjustment arise to make the way seem difficult. At such times any member of the faculty would be glad to do all in his power to help. You can feel, therefore, to bring such problems to us for counsel and guidance.

So that you may see something of the physical equipment with which your training will be carried on, inspection trips of the various laboratories of the Engineering College are being planned for the near future. It is hoped that in this way still more of those questions in your mind may be answered.

A.S.M.E.

(continued from page 12)

only one million five hundred thousand cycles, the new system uses between forty and fifty million cycles, thus widenung the band and cutting down the amount of static.

Eventually we shall emerge into a new system of modulation in which there will be few if any of the present problems, and the improvement will produce an all around better and more enjoyable radio program.

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An Artificial Lover's Lane at Greenfield Park, New York, has upholstered brenches equipped with electric lights which glow red when the seats are occupied, green when free.

N.Y.Daily News

ENGINEERS' SING

With the help and cooperation of the students of Southgate, the Engineers put on their annual Campus Sing on the evening of Dec.1

It was a most convincing exhibition of the varied abilities of engineers in the field of entertainment

The musical talent of the Engineers was brought forth in the Engineers' Glee Club and a swing quintet The Engineers' Glee Club, consisting of twenty members under the leadership of Mrs. W. H. Hall, wife of our Dean, sang "Dear Land of Home,"Passing By,"and a humorous encore "Humpty Dumpty" The swing quintet consisted of a drummer, clarinetist, trombonist, pianist, and a guitarist.

The Engineers in addition to lending musical talent, also added humor and magic to the program by placing before the public for the first time Chuck Holley, "The Wizard", and Don Sparrow, his prodigee. "The Wizard's" self-illuminating light bulb and the prodigee's defying the laws of gravity by the suspension of a ping-pong ball in space, along with his mathematical calculations kept the audience amused as well as intrigued.

Thanks to the leadership of Hugo Phillips and the applause meter, the audience was allowed to sing the song they preferred.

The Sing was "topped off"by spinning the magic dial to award the door prize of one live, white rabbit to the occupant of row C, seat 127,of the middle section of the auditorium.

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A laugh is worth a hundred groans in any market.

B. Franklin