The Part the University Has to Play in the Training of the Marine Engineer*

MR. A. T. LINDLEY, B.Sc. (Chairman) called upon Mr. A. W. Jones, B.Sc. (Associate Member) to open the discussion on "The part the university has to play in the training of the marine engineer".

MR. JONES said that the term "marine engineering" covered a very wide range of activity, and a man could be a marine engineer in many different spheres, as a superintendent of a shipowning company, a consultant, a surveyor of a classification society or of the Ministry of Transport and Civil Aviation, or for underwriters, a sea-going engineer, and also as a member of an engine builder's staff. In his view the sphere which demanded the widest range of knowledge and interest was that of superintendent engineer or consultant, whose work could be divided into three main categories, namely: staffing, maintenance and survey; voyage analysis and research; and specification of new tonnage.

The marine engineer was not usually concerned with the detailed design either of the hull or of the various items of machinery with which it was equipped, but he was vitally concerned with the proper matching of the hull and the machinery into one harmonious whole. The effectiveness of a ship and the success of its design as an economic unit was primarily dependent on the compatability of the hull and machinery installation with the conditions of trade and route for which it was intended.

The important work of design and specification of new tonnage called for the highest qualities on the part of the designer, and was increasingly important as competition from foreign shipping increased and as profit margins decreased. Indeed, the soundness of a firm's position was considerably dependent on the wisdom and the thoroughness with which the work of the superintendent and his associated consultants was carried out.

As the choice of machinery widened and as complexity increased, so the design of the preferred installation became increasingly more involved and the marine engineer had to increase his own breadth of interest and knowledge in order correctly to appreciate the ever-widening possibilities. Looking round, one certainly had to agree that the possibilities were widening.

For example, the gas turbine provided a new type of both main and auxiliary machinery, and for any particular installation consideration should be given to either open cycle or closed cycle turbines with varying degrees of intercooling and reheating. There was also the possibility of a two-stroke cycle engine, either of free-piston type or of more normal design which could be used as a power-gas generator and which would exhaust into a gas turbine. Such combination machinery was already at sea in small installations.

In the case of steam turbines, temperatures and pressures were being advanced, and for any particular ship the best compromise had to be reached between increasing economy, increasing first costs, the complexities of the installation, and acceptable standards of reliability. Pressures had sometimes been limited because of the difficulties associated with reheating, the difficulties of accommodating the return steam pipes between turbine and boiler. However, there was now the possibility of achieving the transfer of heat between boiler gases and the steam through the use of an interconnecting closed circuit of liquid metal, the liquid metal pump and the necessary handling technique having been designed as a sideline in the use of atomic energy for power generation. There was certainly a field for that type of heat transfer in ships. It would be possible to reheat without taking the steam back to the boiler.

Diesel machinery had always offered the choice of direct or geared drive, and the possibilities of that choice were being increasingly considered. Transmission itself provided many problems, while the increasing use of electrical auxiliaries and controls, together with the question of whether to use A.C. or D.C., made it imperative that a marine engineer should possess a firm grasp and understanding of the operating characteristics of electrical machinery. He did not propose to mention any thing about electrical transmission; he merely mentioned the subject as one of the many transmission problems.

An installation having been chosen and designed, it was equally important that it should be run and maintained at the peak of its efficiency and at the designed conditions by men with a full understanding of the first principles of the machinery involved, if full economic value were to be obtained. Furthermore, it was essential that accurate data under service conditions should be collected so that actual performance could be recorded and analysed and compared with that which had been expected, thus providing an increasing store of first-hand information for future use.

It was in this work of designing, of development, of collecting accurate data, of maintaining and of operating a complete installation at peak efficiency that the engineer applied scientific principles and sound reasoning. That differentiated him from the artisan who constructed and operated without scientific knowledge.

To be an engineer in the highest sense of the word, it was not essential to be engaged in designing, but it was essential to have a knowledge of, and an ability to carry out, design based on scientific principles, such design necessarily incorporating economics and safety as well as functional and æsthetic objectives. Indeed, it was desirable to incorporate as many æsthetic objectives as possible.

The term "design" was used in its widest sense and covered the whole creative process from the initiation of ideas to the final refined plan or specification. "Design" very often meant different things to different people.

It has been claimed that the diagnostic characteristic of an engineer was "an ability to apply creatively scientific principles to design or develop structures, machines or manufacturing processes or arrangements, utilizing them in combination; or to construct or operate the same with understanding of their design and limitations of behaviour imposed by such design; or to forecast their behaviour under specific operating conditions;

* Discussion following the Annual General Meeting of the Education Group on 19th March 1954. The Minutes of the proceedings of this meeting appear on pp. xxxviii-xxxix of Vol. 65 of the TRANSACTIONS.

all as respects an intended function, economics of operation and safety to life and property". He thought that this was a correct diagnosis.

Thus, from a consideration of his work, it was seen that the marine engineer well merited his inclusion in the engineering profession, and it followed that the acquiring of a knowledge of the scientific principles which governed the design of ships and their machinery should form an essential part of his training.

Expressed briefly, a university training in an applied science such as marine engineering had the following aims: (1) to ensure a clear understanding—and knowledge of their application—of first principles of those subjects which were of concern to the particular branch of applied science; (2) to develop within the student an inquiring mind, an ability to reason soundly, and a capacity to express that reasoning clearly; and (3) to develop personality and character.

It was recognized that those aims could be achieved by the individual in the hard school of self-tuition and practical experience, but it was considered that the university provided the most satisfactory means for their attainment and at the same time provided the necessary breadth of scientific knowledge which was required for the highest spheres of marine engineering.

If it were accepted that a suitable university course was desirable as an appropriate part of the training for certain branches of the profession, then came the question: when should it be taken? Should it follow immediately after the secondary school, or should there be an interval of workshop experience in between the secondary school and the university for those who wished to follow that path?

It was understood, of course, that the university could provide only part of the training of a marine engineer and that in view of the intensely practical nature of the work and its heavy responsibilities, a considerable practical experience of actual sea-going time was a further essential part of the training. In order to enter into that period of training, the graduate engineer had to have a minimum of twenty-one months of workshop time at heavy fitting and erecting, of which the present Ministry of Transport and Civil Aviation regulations required that twelve months should have been served continuously after graduation. The carrying out of that provision gave rise to a difficulty as students did not normally enter a university until about the age of eighteen. They were accepted at a little earlier age if they had already spent two years in the sixth form, but normally they were accepted at about eighteen years of age.

That meant that the students were twenty-one years of age before they graduated, and engine builders were understandably not anxious to pay a man at the rate which they were obliged to pay at twenty-one years of age, when he was avowedly staying for only one year and was then leaving to join a shipowner. That engine builders did so at all spoke highly for their public spirit.

From many points of view, it seemed preferable that the twelve months' continuous period should be done before the student went up to the university, preferably when the student was between seventeen and eighteen years of age. That was a point on which he would be glad to hear discussion and the opinions of other people.

Having completed both workshop experience and university course, the graduate must then go to sea to gain practical experience, and also, incidentally, to complete his National Service obligations. It was considered that until he had gained the First-class Certificate of Competency the only preferential treatment to be accorded a graduate should be the ensuring of as wide an experience with as many different types of machinery as possible. However, soon after certification, and if the company were satisfied that he was the kind of man required, it was considered that the graduate engineer could best be employed on special assignments, such as, for example, the collection of specific data from particular installations, or going to sea with a new type of machinery, whether it be main or auxiliary. Where there was experimental plant, it seemed desirable that a man with his first-class certificate and a university training behind him should accompany it, make sure that the instrumentation was correct, and bring back accurate records.

The watchkeeping engineers had their time fully occupied and could not be expected to take other than the normal routine records, so that the use of graduates for the collection of any other more detailed records would seem to be a proper use for such men, and at the same time it would give them further experience and training which should ultimately equip them to become full members of a superintendent's department.

It was inevitable that at that stage a certain number would be diverted to positions in classification societies, research organizations, with engine builders or other allied employers.

It was the shipowner who needed that type of qualified engineer more than the engine builder. The engine builder was primarily concerned with manufacturing and selling particular types of machinery and equipment but the marine engineer was responsible for the overall design of the ship and its complete installation and was later responsible for its operation and maintenance. Thus, it was important for shipowners to have on their staff men who had had a broad training in scientific principles, who were able to initiate developments themselves, and who were able to adapt and apply developments in other branches of engineering to the service of marine engineering, so that ships and machinery might be continually improving and developing as fast as possible.

He proposed to outline what appeared to him to be a reasonable type of course for marine engineering in the university.

As already noted, the marine engineer had to collaborate closely with the shipbuilder, the engine builder, the propeller manufacturer, the boiler maker and all the other suppliers of equipment during the period of design and construction, and later he had to arrange for the efficient running and maintenance of the whole installation. Therefore, it was suggested that a university course suitable for students of marine engineering should broadly consist of:—(1) the fundamental work of a mechanical engineering department, particularly those principles concerned with power plant; (2) the fundamental work of an electrical engineering department, particularly the work dealing with the characteristics and operation of power plant; (3) marine applications of that work; and (4) certain of the fundamentals of naval architecture.

The breadth of interest of such a course, spanning as it did mechanical engineering, electrical engineering and naval architecture, would seem to necessitate its extending for three years after the intermediate examination, making a complete course of four years' duration.

At present the normal method of entrance to the university was via the General Certificate of Education, either into the first year or straight into the second year. At least one university had a special entry for a man with a Higher National Certificate in engineering provided he had two years' experience in industry and provided he passed a test in English satisfactorily.

As to the suggested course, the first year would be devoted to mathematics, physics and chemistry. The course for the remaining years would be:—

	2nd year	3rd year	4th year
Strength of materials	—	—	—
Heat engines	—	—	—
Electrical engineering	—	—	—
Marine engineering	—	—	—
Theory of machines	—		
Fluid mechanics	—	—	
Mathematics	—	—	
Naval architecture		—	—
Metallurgy	—		—
Management and economics ...			—
Laboratories and drawing office	—	—	—

In the North East Coast area the engine builders and ship-

builders were very generous in providing facilities for organized visits by small groups to their works at any time during the term, and advantage was taken of that in order to supplement the teaching and laboratory work within college and to provide a link with the actual world of ships and engines.

It was considered that a further useful link with practice could be established if certain shipowners would be willing to take a limited number of students in a supernumerary capacity on a voyage during the summer vacation between the third and fourth years at the university. It would be in the nature of a revival of a past privilege, as prior to 1925 it had been the custom of certain companies trading across the North and South Atlantic to take engineering students for a voyage during the summer vacation.

It was now suggested that the privilege should be extended only to those students who intended to go to sea later and take their certificate examinations. At present there appeared to be a considerable unwillingness on the part of graduates to go to sea. His experience was that only about half of those who qualified in marine engineering actually went to sea, and that the greater proportion of those who went were Scandinavians or Greeks who had come to this country for their education. Many of the British students took posts as mechanical engineers. The shipowners were largely unknown to them, and if posts ashore were offered, the students took them. As a case in point, he was aware of two men who intended to enter the service of the National Coal Board on the completion of their training. There were quite good jobs under the National Coal Board for mechanical engineers, and a man who had had a marine engineering course was equally qualified as a mechanical engineer. In the present state of employment, there was a considerable demand for graduate engineers for many kinds of shore posts and if students had an opportunity to see something of what marine engineering meant before they reached their final year the wastage might not be so great. The suggested voyage at the end of the third year might help.

His conclusions were, very shortly, that the university had an important part to play in the training of a certain proportion of marine engineers, that shipowners would need the services of university-trained marine engineers in greater degree as more advanced working conditions became available and installations became more complex, and that shipowners had to attract the right men in the face of considerable competition from other industries.

MR. R. N. COOK (Member) asked Mr. Jones to confirm that he had said that a man might be admitted into the first year of a university course as a holder of an Ordinary National Certificate provided that he passed an entrance examination in English.

MR. JONES said that it applied in the case of a holder of an Ordinary National Certificate. It depended on the standard at which it had been passed. It was usual to take the principal's report. It was possible that the marks of the subjects together with English and together with the fact that he had had two or three years' practical experience had enabled the holder of an Ordinary National Certificate to be admitted, but it was more usual for there to be direct entry into the second year of the course for a man with a good Higher National Certificate together with merit in English.

MR. COOK asked whether the "sandwich" scheme was still in operation in the North East Coast area.

MR. JONES said that the scheme was in operation at Glasgow but not at Newcastle.

MR. COOK said that the scheme was in operation at Newcastle in 1920. Mr. Jones had spoken about students going to sea. For several years he had suffered them. After they got over their seasickness they were shown where the engine room was. They then discovered that there were attractive females on deck, and one could never get them below again.

MR. JONES: Then I would specify cargo vessels!

COMMANDER(E) F. ROBERTS, O.B.E., D.S.C., R.N.(ret.) (Member) said that he was not sure that he agreed with Mr. Jones about the necessity of a bachelor of science in marine engineering going to sea, but he did not know whether that was the concensus of opinion.

For the marine engineer at any rate, marine engineering involved going to sea. He did not regard the designer in the marine engineering works as a marine engineer unless he had been to sea. The work of the marine engineer involved a considerable number of things which came within the discipline of the sea but did not come within the discipline of a university.

"Engineer" derived from the same Latin root as "ingenuity". A person who was an engineer had to have a great deal of ingenuity, and the marine engineer had to have ingenuity in great quantity in order to be able to cope with any situation that he met.

While it was necessary that the marine engineer should know the basic principles of the plant that he was operating, it was not necessary that he should know the minutiæ of the drawing board design of the plant. Once a plant had been designed and finished, there was little that one could do in the way of altering its designed efficiency. There were, however, things that one could do in the way of improving it; his experience was that the drawing board designer very often made mistakes due not to faults in his academic knowledge but to lack of practical or sea-going knowledge of matters. Marine engineers very often found that they had to put things right. There were such things as teething troubles. When one had a new type of plant in a sea-going ship, the teething troubles consisted of eliminating the faults of the designer, faults which had arisen because the designer had not quite appreciated all that might happen in the engine room of a ship and had, therefore, not appreciated the requirements.

The stress in universities was particularly on academic knowledge—that was the business of the universities—but the stress in the case of a sea-going engineer was, instead of on academic knowledge, on his ability to run the machinery efficiently, to maintain it efficiently so that it gave the maximum degree of reliability and, more important still, his ability to deal with the breakdowns and faults which might occur, very often under difficult circumstances. There was no training for that in any university. The heat engine laboratories of universities contained machinery which was run very little, was looked after meticulously by the laboratory assistants and was fitted with dials, gauges, thermometers and so on which more often than not were absent from sea-going machinery because the shipowners considered that they added to the expense and, therefore, they did not see why they should fit them.

He considered that the training ground for the marine engineer was at sea. The marine engineer should be given a basic training, but he considered that that was probably covered by the new scheme of marine engineering apprenticeship training introduced by the Ministry of Transport, for it trained the young man in the fundamentals. But was it really necessary to take the young man into the ramifications of academic training and academic theory about this, that and the other when all that he had to learn was how to deal with the engines at sea, how to deal with the engine room staff and how to deal with the emergencies which arose? Those emergencies arose sometimes because of the failure of the designer to appreciate certain points, sometimes because of poor workmanship and poor materials, sometimes because of the general cussedness of things and sometimes because of a failure on the part of some member or other of the engine room staff.

His opinion was rather based on the fact that during the war at various times he had four degree engineers under him. The degree engineer was rather apt to go into his profession with the idea that he knew a good deal more about everything than anybody else did, and the first thing that one had to do was to disabuse him of the idea, and it was sometimes rather

difficult to do that. However, until the man had been disabused of that idea, he was not a good engineer officer.

He could give a certain number of other examples from his experience, but as they might apply only to his case he would refrain from doing so. However, as a result of his experience of the university trained engineer and his experience of the marine engineer, his candid opinion was that he did not think that there was a fully trained university engineer who was a sea-going engineer.

A course in marine engineering at a university might have its uses for those students who proposed to go as designers with shipbuilders, and engineers who proposed to go into research. Students rather seemed to think so, too, for frequently, having done their course, they avoided the sea and found themselves a white collar job at a good scale of pay—instead of a dirty job in the bilges where they would wear boiler suits—with firms who were willing to pay them on the strength of their qualifications. If there were a university course for marine engineers, he did not think they would get many marine engineers out of it.

MR. STEWART HOGG (Chairman of Council) thanked Mr. Jones for stimulating the thoughts of the meeting.

They were living in a changing world; many of them were brought up with the idea that the only good engineer at sea was a good fitter. That may have been the case, but things had changed somewhat from the days when a good fitter was the one man who was required.

No matter, however, what a man's education was, he did not join his first ship as chief engineer. He at times heard complaints from both sides of industry that some of the young men with better education going to sea these days were of no use to the chief engineers.

He did not despise a university training; in fact, he was all in favour of it, but an agreed system of practical training ought to be followed by the student. A youth, in his opinion, should first go into the shops and find out whether or not engineering was his natural calling. After at least twelve months' shop experience with dirty hands he might then go up to a university. After graduating he should return to the shops to improve his skill and gain further practical experience before he sought employment in the service of a shipowner as a junior engineer. The system he advocated was sometimes called "The thick sandwich system".

It was idle to suppose that any university graduate would be willing to remain at sea after he had obtained his first-class certificate. Such men, it was hoped, would find a niche in the shipping industry on work where their education and practical experience would contribute to the general progress and improvement of ships and their machinery.

With regard to the criticism of the Ministry's Notice No. M.359 in respect of the practical training periods for graduates, it had been difficult to meet the arrangements obtaining in the different universities and colleges, and all he could say was that the graduates from King's College appeared to have been very unfortunate.

There were many other points that he would like to take up in detail but he would refrain from doing so on this occasion.

MR. W. MCCLIMONT, B.Sc. (Member) said that Commander Roberts had stung him into making one or two remarks.

The first thing that struck him about this subject was that there seemed to be almost as many definitions of a marine engineer as there were people present at the meeting. They must be very careful in their interpretation of the remarks of Mr. Jones in relation to the exact reason why he was proposing such training. The assumption that a university training should be regarded as an essential part of the training of every marine engineer was not something that Mr. Jones was putting forward at all.

He wanted to make it clear where he stood in the matter. He was a university graduate. He felt that there was a very strong case for the degree course in marine engineering which he was fortunate enough to have had, and he was a very strong protagonist for it, but he would say very definitely that he and his co-students from the moment that they embarked on the course did not intend to stay at sea. He felt that applied to all his contemporaries when they were embarking on the course. The chief fault which he would find with the trend of the remarks by Mr. Jones was that there seemed somehow to be an underlying assumption that the university undergraduate who embarked on a marine engineering course would see it all the way through until he got his first-class certificate of competency. He considered that that was a false assumption.

That led up to the question of whether or not that was the road which all superintendent engineers of the future should follow. On that point again, he felt that it was not quite the case. He felt that the superintendent engineers' departments of the future would be in a position to make a considerable amount of use, right to the highest positions, of people who were not, in fact, qualified to take ships to sea. He did not for a moment suggest that they did not require to obtain a very considerable amount of practical experience at sea during that time, but he did not think there was any need to consider that it was essential for them to have achieved a point where they were in a position to take a ship to sea.

Some reference had been made to American practice. On a recent visit to the United States, he had formed a very strong impression of a very marked difference in approach. The American approach was generally that the operation of the ships by the company was purely a business concern in that the ship should be designed by somebody else and should be bought complete. It was rather like buying an automobile. The attitude was that one bought what someone else had designed and that one limited oneself to the question of running it.

That led him to ask what the British practice was in that connexion. He did not know. He did not think that one could say that there was a really British practice in that direction because it seemed to range very widely from the school which held the view that it should be left to the shipbuilder and the engine builder, to the school on the opposite extreme which held that everything should be specified, and in between there was the school whose policy could best be described as meddling.

It was not only necessary for Mr. Jones to put forward his case in favour of university training; he ought also to be a very strong protagonist for the employment of university graduates in the industry. It seemed to him that at the present time anyone who went ahead and took a university degree in marine engineering would find considerable difficulty in persuading the vast majority of the employers in the industry that there was any scope for him.

MR. A. LOGAN, O.B.E. (Vice-President) thanked Mr. Jones for opening the discussion. He said that he spoke as a superintendent engineer, and that he did not altogether agree with Mr. McClimont on one or two points.

First of all, he considered that there was considerable scope for the university-trained man or those with high technical qualifications on the staff of the superintendent engineer's department, but in saying that he would stress that such a man should have sea-going experience to enable him to learn how to apply the knowledge he had gained at college.

During previous years he had encouraged several lads with high technical qualifications to stay at sea, and to get their Ministry of Transport Certificates. At the present time they would probably get their First-class Certificate at twenty-five years of age.

MR. HOGG: After 2½ years at sea.

MR. LOGAN said that probably after obtaining their chief engineer's certificate such men would ask for shore appointments. His reply to them would be that they should get further sea experience, both with machinery installations of various types and also in the controlling of men.

The advantage of having a capable technical staff had manifested itself in his company where a large tanker building programme was in hand. While the machinery design was undertaken by the engine builder, the superintendent's technical staff, besides taking an active interest at the design stage, had been able to co-operate with the builders to produce an efficient machinery layout, particularly applicable to the tanker. In other words, the college training and the sea experience must go together.

With regard to workshop training for the university student, he would advocate that the student should go to the works first; that is, after leaving school he should have practical training. He supported Mr. Hogg on that point, and suggested the young man should have at least three years in the works. Such a man had to learn how to use his hands and he had also to appreciate the qualities of the British workman. Such experience, it was suggested, would give such young men a different outlook upon life which they would miss if they went direct from school to the university.

Mr. Jones said earlier that universities developed personality and so on, but he believed that in the works the young man's character could be developed equally well.

MR. C. H. TAYLOR-COOK, B.Sc.(Eng.) (Member) said that Mr. Jones had painted a fascinating picture of the advanced work with which a marine engineer might be faced when he was fully qualified, but he wondered how far Mr. Jones thought that the young man would get towards the state of being able to deal with that sort of thing by the end of his university course.

He did not agree with the implication that a university was the only place where one could achieve this state. Perhaps both of them were speaking from a biased point of view, Mr. Jones from a university point of view and he himself from a technical college point of view. He agreed with what had been said about the objects of the course, but he would delete the word "university" and substitute the words "technical college". He felt that at the end of five years the technical college could produce a man with as thorough a grasp of the basic principles as a university graduate. It must be remembered that, while the university graduate probably had more hours devoted to study during his course, he was faced with his practical training afterwards, while the technical college student was getting his practical training at the same time as his theoretical training.

He wondered whether Mr. Jones realized the implications in his statement about admission to university courses, in which he said that the entry was via the General Certificate of Education into either the first or the second year. He presumed that it would be at the advanced level for admission into the second year.

MR. JONES: Yes.

MR. TAYLOR-COOK said that Mr. Jones said that a "good" Higher National Certificate would be needed for entry into the second year, thus putting the H.N.C. on a par with the G.C.E. He would object to that.

COMMANDER(E) H. T. MEADOWS, D.S.C., R.D., R.N.R. (Member) said that he wished Mr. Jones to know that he agreed with his statement that the soundness of a firm's position was considerably dependent on the wisdom and thoroughness with which the work of the superintendent engineer and his staff was carried out. To lend further and more influential support to this statement, he quoted an extract from the speech of Mr. (now Sir) Donald Anderson at the Institute Annual Dinner in 1953: "To those outside the industry the name 'Superintendent' may not mean very much, but to those who are in, it means all the difference between progress and decay, between economy and extravagance, between care and neglect, between loyalty and unrest. A company is as good as its superintendent, and I do not mind who hears me say so".

The question of time in the shops had interested him, particularly in that both Mr. Hogg and Mr. Logan were agreed that the time in the shops should be spent before the student went to the university, and recommended a period of three years. As, however, the time was only twenty-one months, and only a year of that continuous, he thought that a student would learn much more about the practical side of marine engine building if he did his shop time after leaving the university. In this he spoke from his own experience as an apprentice, when for the first two years he had done little else than repetition work on small machines.

He said that two speakers had referred to the question of time at sea. He did not think that those questions were applicable, sea time being necessary if for no other purpose but to satisfy National Service requirements. In normal circumstances this would be for four to five years. During this time a graduate would obtain a first-class certificate, and would almost satisfy the length of sea service qualification which Mr. Logan thought desirable.

Mr. Jones's statement that at present many university graduates were going to attractive positions in the National Coal Board, had prompted him to ask if such graduates were excused National Service.

With regard to entrance to the university, in his opinion it was desirable for a marine engineer to have a knowledge of at least one foreign language. He asked whether the university entrance qualification included a foreign language and English.

MR. D. G. ALCOCK (Member) said that he did not wish to make himself unpopular, but the speakers seemed to have deviated from the point. Apart from Mr. Hogg, who had made some general remarks, Mr. Logan was the only speaker who had stuck to the point. They were present to discuss the part which the university had to play in the training of the marine engineer. He felt that that was a bit of a misnomer. If the discussion had been entitled "The part the university has to play in assisting the marine engineer" there would have been much in the remarks of Mr. Jones with which he could have agreed.

He noticed that there had been a number of provisos in the remarks of Mr. Jones, such as that what was suggested would apply only to a certain proportion of marine engineers. The point about having some marine engineers trained at universities was well put by Mr. Logan.

He felt that Commander Roberts rode a hobby horse as a result of bitter experience and thought he misinterpreted the point in assuming that university training was applicable to all marine engineers. That was something with which he himself would not agree.

He also wished to refute what had been said by one or two other speakers in regard to university training for superintendent engineers. He would have thought that the position of engineering superintendents was concerned with, as it had always been, general management through their other subordinate superintendents. He would have thought that a good deal of practical experience and really first-hand knowledge of the job were required to make a successful engineering superintendent. He hardly thought that a man with an extremely limited practical experience was suitable for the highest positions in the marine engineering profession. The true place of such a man was as an assistant to the superintendent.

MR. LOGAN said that Mr. Jones had referred to the university-trained man going to sea. He was afraid that that would be more difficult than ever now, particularly since the alternate apprenticeship scheme was evolving. Firms were taking their own apprentices to sea, and most firms were really full up. He suggested the difficulty would be encountered in that direction.

MR. MCCLIMONT said that, on the point which several speakers had mentioned, it might be profitable to examine the sea-going records of certain eminent superintendent engineers

who were quite well known to members of the Institute in order to prove that it was not essential to have a great deal of sea-going experience.

MR. HOGG said that he wished to amplify a point on the question of training. Generally speaking industry, particularly in recent years, did not train the majority of their apprentices to become skilled craftsmen. The trend these days, so far as the student and graduate types were concerned, was to give them a training to fit them for such positions in the industry as designers, technical salesmen, production engineers, research and development engineers and managers—but not for positions as junior sea-going engineers. That, he thought, was the explanation of the criticism of the craft skill of the better educated junior engineers he had mentioned earlier.

MR. JONES (in reply to the discussion) said he would first take the point raised by Commander Meadows concerning National Service. The National Service obligation was waived for anyone taking approved service with the National Coal Board or in agriculture in exactly the same way as it was waived for men joining the Merchant Navy. There was no complete exemption, but the obligation was waived provided a man remained in one of the three industries mentioned until the age of twenty-six years.

It appeared that Commander Roberts considered only sea-going engineers were entitled to be called marine engineers whereas he (the speaker) considered there were several other spheres of activity within marine engineering. He had not made the claim that all marine engineers required university training, but he did suggest that such training would be of considerable benefit to those marine engineers who were responsible for the design and specification of new tonnage, or for the development of new types of installation, or who were in any way engaged in research problems in connexion with ships and machinery. It was in these directions that he saw the increasing need for university-trained men.

It was not suggested that a university training of itself was sufficient. There was need for considerable practical experience, and for a graduate who intended to become a marine engineer the obvious course was to fulfil the National Service obligation by going to sea while at the same time obtaining the Ministry of Transport's certificates of competency. It was agreed that a further three or four years of sea-going experience was desirable for any man who later might join a superintendent's staff, but it should be recognized that a graduate engineer would not be likely to remain at sea after the age of twenty-six years unless the shipowning company clearly gave him some indication of their interest in him. This perhaps answered Mr. Logan's point, which was a good one, and he had to agree that it was in the years after the gaining of the first-class certificate that a young engineer would begin his training in taking responsibility and in the control of men.

He appreciated that the existence of the cadet scheme of training marine engineers must make it more difficult for owners to take university students on an "introductory" voyage. This was to be regretted, as in the only two instances in which he personally knew of students who had had a voyage, the effect had been remarkable. In each case the student had returned to his final year full of enthusiasm for his future profession.

In answer to Mr. Taylor-Cook, he had no desire to enter into a duel of technical college versus university. In the training of marine engineers there was need for the training and courses given by both institutions. Generalizing, he would say it was desirable that all marine engineers should have had a technical training up to the standard of the Higher National Certificate and that for those who, as mentioned previously, intended going on to the design and research side, a university training was desirable. The two institutions were not competitive, rather they were complementary.

Concerning university entrance qualifications, he pointed out that a language other than English was required under the normal matriculation regulations, but that under the regulations of the University of Durham a candidate who held the National Certificate (Ordinary or Higher) or the National Diploma and who had two years' experience in industry, might be permitted to matriculate for any degree course in applied science to which the Certificate or Diploma was relevant, provided only that he had passed a test in English which was considered acceptable.

With regard to the "sandwich" scheme of training, so far as he knew, it was only practised at one university. It had fallen into disuse, perhaps because most of the larger firms of mechanical and electrical engineers preferred to take university trained men on completion of their course and give them a post-graduate period of training or apprenticeship. This was the most usual scheme in the United States also. In marine engineering, the sea-going experience could be considered as analagous to the post-graduate training schemes in the other branches of engineering, and the workshop training was primarily aimed at giving the young graduate a sufficient manual dexterity in the craft of fitting to enable him to carry out adequately his tasks as a watch-keeper. It thus transpired that the workshop training to be done by a graduate marine engineer had no parallel in the usual training schemes for graduate engineers in other branches of engineering. He considered it was a very valuable extra and agreed with Mr. Hogg that the twenty-one months allowed by the Ministry of Transport Regulations was probably a minimum period for the training, but he also hoped it would not be extended.

Mr. Jones said he had been glad to hear the expressions of opinion as to the best time to do the workshop training. While there was much to be said in favour of the bulk of the period being done after completion of the university course, in his opinion it was highly desirable that the prospective student be accepted as an apprentice before the age of eighteen years and that he should gain a portion of his training before coming up to university—during this period suitable courses in a technical college should have been attended. Under these circumstances, the young man came to the university as a more mature individual than if he had come straight from school, and as such he was able to benefit more by the university course.

He expressed his thanks for the kind hearing and for the helpful discussion which had followed.

THE CHAIRMAN expressed the thanks of the meeting to Mr. Jones. He said that it was obvious that Mr. Jones had given all members a great deal to think about. All were grateful for the basis for discussion which Mr. Jones had provided.

INSTITUTE ACTIVITIES

Minutes of Proceedings of the Ordinary Meeting Held at the Institute on Tuesday, 9th November 1954

An Ordinary Meeting was held at the Institute on Tuesday, 9th November 1954, at 5.30 p.m., when a paper entitled "Some Operating Experience at 950 Degrees F.", by L. Baker, D.S.C. (Vice-President) and W. H. Falconer (Associate), was presented and discussed. Mr. J. P. Campbell (Chairman of Council) was in the Chair. There were 157 members and visitors present and sixteen speakers took part in the discussion.

A vote of thanks to the authors, proposed by the Chairman, was accorded with enthusiasm. The meeting ended at 8.10 p.m.

Annual Conversazione

The Annual Conversazione was held at Grosvenor House on Friday, 3rd December 1954. The President, Mr. H. A. J. Silley, and Mrs. Silley, received the 1,473 guests.

After dinner, Sydney Jerome's Ballroom Orchestra played for dancing until 1 a.m., and there was an interlude for cabaret when the guests were entertained by the Sixteen Dancing "Belles", Bob Henderson and Ruby Joannson, Phil Darben and Wendy, The Three Famous Allens, the Peiro Bros., and The Six Lynbarrys.

Section Meetings

Calcutta

A meeting of the Calcutta Section was held at the Marine Engineering College on Wednesday, 17th November 1954, when a lecture was given by Professor Dr.Ing. Voelker on "Modern Ship Design". Mr. J. Connal (Local Vice-President) was in the Chair and seventeen members and visitors were present, together with fifty-three students from the Calcutta Marine Engineering College. After a brief discussion, the Chairman proposed a vote of thanks to Dr. Voelker for his excellent lecture, which was carried by acclamation.

On 15th December 1954, at a general meeting of the Section, a paper on "Fundamentals of Boiler Water Analysis and Testing" by J. H. Stevenson (Member), S. Kasturi (Member) and K. S. Subramanian (Member) was presented and discussed.

Scottish

An interesting and instructive lecture on "Problems on Machinery Space Ventilation" was given by Mr. W. H. Glass, O.B.E., at the general meeting of the Scottish Section held in Glasgow on 8th December 1954. The problems confronting the ventilating engineer designer were very clearly outlined by Mr. Glass and methods of overcoming these difficulties were illustrated by lantern slides. Nine speakers took part in the discussion. The Chairman of the Section, Mr. D. W. Low, O.B.E., presided, and the vote of thanks proposed by Mr. W. C. Grant was heartily accorded.

Mr. Glass repeated his lecture at a joint meeting of the Dundee Institute of Engineers and the Scottish Section in the University College, Dundee, on 10th December 1954 and was given a very enthusiastic reception. The President of the Dundee Institute, Mr. W. J. Fox, presided, and the vote of thanks was proposed by Mr. Liddle (Member of Council).

South Wales

Junior Meeting

A meeting was held on Wednesday, 12th January 1955 at Cardiff Technical College when a Junior Lecture entitled "Closed Feed Systems" was given by Mr. D. C. Hagen. There was a good attendance of approximately eighty students and members and the Chair was taken by Dr. Harvey, B.Sc., F.Inst.P. A vote of thanks to the lecturer was proposed by Mr. F. R. Hartley (Member), seconded by Mr. T. Bishop (Member).

West Midlands

At the General Meeting held at the Imperial Hotel, Birmingham, at 7.0 p.m. on Thursday, 6th January 1955, Mr. H. E. Upton, O.B.E. (Chairman) was in the Chair and forty-five members and visitors were present.

Mr. M. W. T. Rees, B.Sc. (Member) presented a paper entitled "Electric Propulsion of Ships". The author discussed the various types of equipment used, which included gas and steam turbine-driven alternators, Diesel-driven generators, magnetic couplings fitted in conjunction with Diesel engines and gearing, and the dual purpose magnetic coupling alternator units used for main propulsion at sea, and supplying heavy auxiliary loads in port. A film was shown which described both A.C. and D.C. systems, and the author continued by stressing the importance of choosing the correct system for the particular conditions involved.

Nine members took part in the ensuing discussion, and the Chairman thanked Mr. Rees for his excellent and interesting paper; the meeting ended at 9.30 p.m.

Junior Section

Kingston on Thames

A Junior Meeting was held at Kingston Technical College on 2nd December 1954, when Mr. D. C. Hagen lectured on "Marine Closed Feed Systems" to an audience of approximately one hundred students of the College. The principal of the College, Dr. J. R. I. Hepburn, took the Chair.

Mr. Hagen's lecture was of particular value for the advice given on correct operating procedure of closed feed systems and his audience showed their interest by the variety and number of their questions during the discussion period.

A vote of thanks was proposed by Mr. Tee, Head of the College Engineering Department.

Mr. R. S. Brett (Associate Member) presented Institute prizes to R. A. A. Gibbons, R. Paveley and K. N. Bexon, the best First and Second Year Students taking the Ordinary National Diploma Course under the Alternative Training Scheme.

Dinner and Dance

The Junior Section Dinner and Dance was held on Saturday, 18th December 1954, at the Chez Auguste Restaurant,

Mr. and Mrs. H. A. J. Silley

Mr. and Mrs. Stewart Hogg, Mr. and Mrs. J. Stuart Robinson, Mr. Silley, Mrs. Robertson and Mr. A. Robertson, C.C.

Annual Conversazione, 1954

Mr. C. J. Hampshire, Mr. Silley, Mrs. Wheeler, Mrs. Silley and Mr. J. P. Campbell

Mr. A. G. Luton, Mr. Hogg and Mr. Silley

Annual Conversazione, 1954

1954 Junior Section Dinner and Dance

Frith Street, Soho, when 130 members and guests, including members of the Institute staff, met for this annual function.

Mr. F. D. Clark (Convener of the Junior Section Committee) proposed a toast to the Ladies and recalled the good advice given by the senior to his junior engineer going ashore whilst in port! In reply, Mrs. H. C. Gibson thanked Mr. Clark for the nice things he had said about the ladies, saying how much the occasion reminded her of many happy times spent at parties on board ship.

Dancing followed dinner, including a number of novelty dances, until hands were joined at midnight for Auld Lang Syne.

It was a most enjoyable evening, coming up to the high standard of this function in recent years.

Membership Elections

Elected 3rd January 1955

MEMBERS

James Allan
Gilbert Lewis Baily, Capt.(E), R.N.
Robert Shand Brown
Walter William Burnup
James Aloysius Eccles
David Price Edmunds, Cdr.(E), R.N.R.
A. W. B. Edwards
Cecil Davey William Ford
William James Gorman
David Currie Hamilton
Alan Richard Jones
William Maltby Lording
Robert Neilson
Arthur James Quayle
Malcolm Neil Stevenson, Lieut.-Cdr.(E), M.B.E., D.S.C., R.N.
George Strachan, B.Sc.
Arthur Langford Thomas
Cecil St. Clere Williams, Lieut.(E), R.A.N.
Richard Arthur Witten

ASSOCIATE MEMBERS

John Beadle
Albert Capelle Bulley
John Chapman
James Stanley Cormack
George William Dennett
David Duff
Joseph Flack
George Marshall Frater
Jack Hodgson Gilbertson
David Harley
Samuel Hunter
William Smith Johnson
Robert Noel Lockhart
David Cameron McAinsh
William Hall McCallum
John Edward Marshall
John Cyril Arthur Mercer
Allan Campbell Morrison
George Kanianthra Oommen Philips
Huggahalli Sundar Rao
William Shaw
Allan Syme
William Henry Tobyn

ASSOCIATES

Richard Dennis Buck
Madan Lal Malhotra Malik
Madhavan Ramachandran Nair, Lieut.(E), I.N.
Thomas Turnbull Newton
Albert Stanley Pearse
Vivian Charles Stride

GRADUATES

Douglas Louis Braganza
Keith Lawrence Branton
Julian George Ferdinand
Edward Alan Fisher
Basil Francis Joseph
Duncan Kent
Bryan David Lee
Derek Lipscombe
Clarence Walton Matthews
Blethyn Charles Morgan
Frederick Francis Roy Phillips
James Frame Rintoul
Stirling MacNeill Ross, Lieut.(E), R.C.N.
George Kinloch Young
Ch. Zulfiqar

STUDENTS

Geoffrey Colin John Moffatt
Michael Harry Wootton

PROBATIONER STUDENTS

Keith Charles Bull

Barrie Edmund Dakers
Peter Anthony Ellison
Raymond Hall
Peter Henry Edward Head
Brian Richard Grace Jones
Philip Leslie Jones
Frederick Brian Longstaff
John Michael Owen
Brian Turner
Roger Alan Wood

TRANSFER FROM ASSOCIATE TO MEMBER

Henry Foxwell Sherborne
Cyril Ernest Strugnell

TRANSFER FROM ASSOCIATE TO ASSOCIATE MEMBER

Kenneth Abel
Anthony John Calvey
Richard Caton
Laurence Olaf Christensen
John Bernard Cowan
Terence Clark Davison
Archibald Arthur Stevenson Dickson
James Edmund Gander
Ronald Humphreys
Anthony Stephen King
Ronald Alfred John Kinsey
Anthony Peter Francis Marquis
Leslie Meek
Alexander Marshall Miller
Dudley John Rees
John Tom Smith
Peter Ward
John Denys Vauxhall Williams

TRANSFER FROM STUDENT TO GRADUATE

Arthur Dudley Thomas

TRANSFER FROM PROBATIONER STUDENT TO STUDENT

David Westby Hobbis

OBITUARY

DAVID BOYD (Associate 13957) was drowned at Buenos Aires on 11th August 1954, aged thirty years. He served an apprenticeship from 1940-46 with the Riverside Engineering Co., Ltd., and shortly afterwards joined the Royal Fleet Auxiliary as third engineer, remaining in this service for the rest of his life. He obtained a Second Class Ministry of Transport Motor Certificate in 1951 and was elected to membership of the Institute in 1952.

GORDON BURNHAM (Member 10207) was born in 1904. From 1926-49 he was employed by the Shaw, Savill and Albion Co., Ltd., and obtained a First Class M.o.W.T. Steam Certificate with Motor Endorsement. From 1949-53 he was an inspecting engineer with the Iraq Petroleum Co., Ltd. He was then taken ill with cerebral thrombosis and was unable to work thereafter; he died on 4th December 1954.

Mr. Burnham had been a Member of the Institute since 1945.

ALEXANDER W. EAGLESOME (Member 4468) was born in 1886. He served an apprenticeship with C. and H. Crichton, Ltd., Liverpool, from 1902-07 and then spent nine years at sea, during which time he obtained a First Class Board of Trade Certificate. He then spent fifteen months as an erector and guarantee engineer for French and Italian meat transport, employed by the Liverpool Refrigeration Co., Ltd., followed by a year as chief engineer of the Portuguese Government's s.s. *Sacaven*, to which he was appointed by Esplen, Son and Swainston, Ltd. From 1919-26 he was on the staff of the last-named firm, first as assistant superintendent for the reconditioning of Portuguese prize vessels, later as surveyor of ship, engine and refrigeration work; he made a special study of refrigeration and was chiefly engaged on this class of survey.

In December 1926 Mr. Eaglesome joined Lloyd's Register of Shipping as a ship and engine surveyor and was appointed to Glasgow on steel testing duties. In April of the following year he was transferred to Buenos Aires and remained there until 1939 when Lloyd's Register re-established their exclusive surveyorship at Rio de Janeiro and he spent the next eight years, until his retirement in January 1947, in that port.

Mr. Eaglesome returned to England and lived first in West Kirby and then in Hoylake, Cheshire. He was a well known member of the Victoria Bowling Club at West Kirby. He died on 21st September 1954.

Mr. Eaglesome had been a Member of the Institute since 1922.

LIEUTENANT-COLONEL HENRY GORDON-LUHRS (Member 4520) was born in 1880 and educated at Dundee High School. From 1896-1901 he served an apprenticeship with the North Eastern Marine Engineering Co., Ltd., at Wallsend on Tyne, and then spent several years at sea, obtaining a First Class Board of Trade Certificate. At the outbreak of the first World War he was works manager with the North Eastern Marine Engineering Company, but in 1915-16 he commanded the 5th Battalion Northumberland Fusiliers, part of the time in France, when he was mentioned in dispatches; he was then seconded to the Ministry of Munitions as director of the Gun Ammunition Filling Department. After the war he returned to the North Eastern Marine Engineering Company as general manager until 1925 when he was appointed managing director of Henry Watson and Sons, Ltd. From 1927 he had been managing director of Carobronze, Ltd., and during the 1939-45 war he was Regional Controller of the London and South Eastern Areas for the Ministry of Supply. He was awarded the C.M.G. in 1917. He died on 12th December 1954.

Lt.-Col. Gordon-Luhrs had been a Member of the Institute since 1922.

PHILIP DAVID HALL (Probationer Student 32) was born in 1935. After a grammar school education he joined the Anglo-Saxon Petroleum Co., Ltd., under the new scheme for the training of marine engineering apprentices and studied for the Ordinary National Diploma at Poplar Technical College from 1952-54. On the night of 31st December 1954 he disappeared in the English Channel from the ship in which he was serving and it is thought that he was washed overboard in the darkness and bad weather.