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on

" EDUCATION OF NAVAL OFFICERS "

EDUCATION OF NAVAL OFFICERS.

HISTORICAL TO 1845

Before 1845 (date of establishment of Naval Academy), the education of officers was decidedly hap-hazard and imperfect. There were some "school-masters" attached to the larger ships but they seem to have been indifferent and most midshipmen gave them little heed. So-called naval schools for midshipmen existed at Norfolk and New York and later at Boston, but there was no obligation for anyone to attend them. It is noteworthy that examinations of midshipmen for commissions began in 1839 and that these were the first of all examinations for promotion ever held in our Navy.

About 1829 four officers were, apparently at their own expense studying at Yale College - another officer was taking a special course in science at Trinity College (Hartford) - and it appears that at about that time there was a midshipman studying at West Point.

In 1838 a Naval School was established at the Naval Asylum (now Naval Home) at Philadelphia, where Professor William Chauvenet (whose mathematical text-books were used at the Naval Academy for many years) as a young man entered upon his long and useful career in the education of naval officers.

It is to be observed that not more than about 10 per cent of midshipmen availed themselves of even these meagre educational facilities.

("CONSTITUTION" - MEMORIAL - 1835)

In 1845, George Bancroft, the historian and scholar, became Secretary of the Navy. In his first six months of office, with keen foresight and on his own initiative, he became responsible for the establishment of the "Naval Academy", though that name was not adopted until 1850.

We are now in the 80th year of the formal education of naval officers.

EARLY TECHNICAL EDUCATION.

In 1871 cadet engineers began their education at the Naval Academy. This was the first definite sign of the changing scope of the education of naval officers. In the year 1899 - 28 years later - marine engineering became obligatory for all officers, the class of 1898 being the last to graduate a separate engineer group.

There were also other signs of the broadening of the field of education. Cadet Engineer Francis T. Bowles of the class of 1879 (later Chief Constructor) requested, under existing law, to be appointed an assistant naval constructor and to be sent abroad for a course in naval architecture. He encountered many difficulties but, together with Richard Gatewood, eventually succeeded in getting permission to attend the Royal Naval College at Greenwich. The Navy Department, it seems, did not pay their tuition or any of their expenses or otherwise give them any degree of "aid and comfort".

Later, this practice of sending naval constructors abroad had the support of the Navy Department and continued until 1900 when, for a year or so, naval construction was taught as post-graduate work at the Naval Academy under the charge of Richmond P. Hobson (of Santiago fame) (this in my own time at the Naval Academy). Finally about 1902 or 3, arrangements were made whereby our

naval constructors were educated at Massachusetts Institute of Technology, where they are still sent for their specializing work.

WAR COLLEGE.

In addition to the field of technical education just described, definite beginnings were made in other parts of the scope of naval education. The formal study of strategy, tactics and logistics was established by the founding of the Naval War College at Newport, R. I. in 1885 - forty years ago. This was due to the foresight, persistence, and energy of Rear Admiral Stephen B. Luce, whose name must always be venerated by officers who take their profession seriously.

NAVAL INSTITUTE.

Mention must also be made, in this brief historical review of the education of naval officers, of the conception and organization of the U. S. Naval Institute in 1873 - some 52 years ago. Its influence on the service, though, perhaps indirect, has been highly beneficial. It has served the distinct function of a service forum and has served that purpose, chiefly, by letting all hands know what some of them were thinking about.

DEVELOPMENT OF POSTGRADUATE TECHNICAL EDUCATION UNTIL 1917.

We come now to the beginnings of the present-day system of postgraduate technical education.

The year 1899 is an important landmark in the education of naval officers. The Personnel Act of that year provided for the abolition of the separate Engineer Corps by amalgamation of the old Engineer Corps with the line of the Navy and so caused the education of line officers to include proficiency in marine engineering. As before mentioned, the class of 1898 was the last class to graduate a separate engineer group. This merging of the Engineers with the line, of course, did not remove the necessity for having officers who were experts in engineering. Shortly after 1899, there also occurred the great upheaval in gunnery, which caused great changes in ordnance material and in ordnance installations. It was these needs in marine engineering and in ordnance that brought about the beginning of postgraduate technical education.

Commencing in the year 1903, two or three officers were selected from each class, as it attained the rank of ensign, to receive special work in ordnance and in steam engineering. Later on, a very few officers were selected for electricity and radio. The work done by all of these officers was largely "practical", and consisted of study of available information in the several specialties and of sojourns at government and private plants where naval material was handled - there was little or no formal instruction.

In 1909, about half a dozen officers of the classes of 1899 to 1902, were sent to the Naval Academy to study marine engineering under the supervision of Captain Milton E. Reed. It seems that their subjects and their methods were left largely to their own individual views. Ordnance men were continued as before except that at each plant there was a definite schedule of things to be done and seen.

By 1912 the Postgraduate School of today had taken definite form under the charge of Captain J. P. Morton (now retired). He was succeeded by Captain John Halligan who was still Head of the School in 1917, when the imminence of our entry into the war put the school out of commission. During this five-year period, 1912-

1917, the Postgraduate School took charge of the technical post-graduate education of officers in steam and electrical engineering, radio, naval construction, some of the ordnance work, and even in law.

The general plan was also established during that period of about one year here, in the "groundwork school", and at least a year at a university or college considered most efficient in the particular specialty desired.

POSTGRADUATE TECHNICAL EDUCATION since 1919.

In May 1919, steps were taken to re-commission the Postgraduate School and it was formally re-opened in June of that year by the Secretary of the Navy in the presence of the then Superintendent of the Naval Academy, Rear Admiral A. H. Scales, the Academic Board, the faculty of the School, about forty student officers and a considerable number of others. When re-opened, the School was established for the first time in its present headquarters, formerly used as a marine barracks.

I had the honor of being the Head of the School when it was re-commissioned and continued in that capacity until July 1921, a little over two years. There were many interesting and important developments during those two years. I say "developments" because the main ideas had been already evolved by my predecessors.

However, analysis of principles was undertaken and emphasis placed on the key principles which were to govern post-graduate technical education. I add "technical" because the use of the term "postgraduate" in the service is generally employed to designate the work that you are engaged in, whereas, the fact is that the courses at the War College are also, strictly speaking, "postgraduate".

GENERAL PLAN.

The general plan of postgraduate technical education provides two definite phases:-

(a) First, about one year at Annapolis for a general review and re-inforcement of general engineering knowledge.

(b) Second, from one to two years at a university for education in a particular specialty.

This "general plan" is confirmed by two important facts which I will mention:-

(a) All the work which you gentlemen take is essentially "engineering" in the broad sense. It doesn't matter whether it is called engineering or naval construction, or radio, or civil engineering, or ballistic engineering, or aviation engineering; as all of these terms have to do with "the art of science by which the mechanical properties of matter are utilized in structures and machines".

(b) Practically all engineering and technical schools require that first year work be the same regardless of later specialization; and an increasing number of them make the first two years the same for "all hands".

THE "GROUNDWORK SCHOOL".

In emphasis of this governing principle, the general term "groundwork school" is employed to cover the work done here at

Annapolis. The scope of the several courses may vary somewhat, but the purpose of all is the same, i.e. - to send the officer on to study his specialty with a thorough foundation in mathematics and physics, and the essential co-ordinate knowledge of other scientific branches.

At this point, I wish to express some general ideas that support these principles.

First, the "science of sciences" in engineering is physics - any competent physicist can, in due time, deal with any engineering problem whatever, because all engineering of whatever kind goes back to physics for its fundamentals and for its derivation.

Second, our perspective is somewhat distorted in many respects through habit and general service practice - ordnance offers a typical example of this - but - a breech mechanism is only a special kind of valve designed to deal with very high pressures; a gun is only a special kind of one-stroke gas-engine, made automatic in certain types as in the case of the machine gun. Again, the torpedo is a self-propelling ship of small size and special form.

Third, ordnance design is mechanical engineering; fire control devices come almost entirely within the scope of electrical engineering; explosives and gas are in the general field of chemical engineering; ballistics is a highly complicated development of mechanical engineering, and torpedoes are chiefly within the scope of mechanical engineering.

Fourth, the civil engineer and the naval constructor must know a good deal about electrical engineering; the radio engineer must know electrical engineering thoroughly. All engineers must expect a knowledge of thermo-dynamics, chemistry and metallurgy to become at any time essential to his understanding of problems arising, directly or co-ordinately or even indirectly, in his own particular field.

Fifth, none of us would have much faith in an eye doctor who had never studied or dealt with anything except the eye. We expect and appreciate his general foundation as an all-around medical man before he became an eye specialist. In fact, "quack" is the common term for one who professes a specialty in medicine without adequate and suitable education and training in the fundamentals of medicine.

Sixth, all officers taking postgraduate technical courses are and are expected to remain, naval officers.

The governing principle is that you acquire a sound foundation on which to erect the superstructure which is your specialty. The general result is that you leave here with the approximate equipment of a junior in a regular four-year engineering course:

I dwell on this point, probably, because of the experience with the radio group of four officers who began their postgraduate work in the summer of 1919. They never could understand why they had to study anything except what was labeled "radio" in large and conspicuous letters. They were allowed to express their views but were held firmly to the school requirements while they were fully acquainted with the ideas just expressed. They struggled through their year here and eventually attended their heart's desire by going to Harvard to take up radio exclusively. Eventually, they returned to general service and I have talked with three of the four; two of them freely admitted that the school was right in its method; the third was beginning to think there was something in

it; the fourth whom I have never since seen, I don't expect ever to learn that he was wrong.

To sum up, have faith in the courses prescribed for you - they may not look right now but they will in time - don't be too sure about what you think you should learn until you have completed your work and have had some experience in general service. Then take your pen in hand, if you wish, and tell the Head of the School how you think matters could be improved.

You may be very sure that your recommendations will be most carefully considered.

THE UNIVERSITY COURSES.

The selection of universities for the second part of the general plan is highly important. It is complicated by a variety of considerations, but the general rule holds that the selected school must be of the highest standards for the particular specialty. It does not matter a bit that the university may have the largest laboratory or the greatest number of students - it is the instruction offered that must be considered. A determining factor is the personality, capacity and views of the dean of the department, e.g. - when the school was re-opened in 1919, a couple of men took "explosives" at George Washington University because Professor Monroe was there to instruct them - when he severed his connection with that institution, it dropped out of the picture.

A year or so later, when seeking a school for instruction in explosives, the University of Michigan was very prominent in the consideration. During a visit to Ann Arbor and while talking to the Dean of the Chemistry and Chemical Engineering Departments, I told him that we had omitted in the correspondence to make special mention of our desire to include the gases of gas warfare in the instruction to be given. His reply was prompt to the effect that as the principles involved had the same chemical foundation, they could do the gas part easily - and that reply, showing his breadth of view and conception of fundamentals, settled the selection.

THE PURPOSE OF EDUCATION.

This incident may serve to fix in your minds a vitally important fact that must never be forgotten. Principles, especially governing principles, are relatively few; the applications of these governing principles are practically innumerable. Do not let yourselves be confused as between application and principles - always, in tackling a problem, stop and consider what is the principle, or principles, on which it rests. Many of the present-day problems involve combinations of applications and, therefore, probably of principles - but - the method of dealing with them is the same. The "scientific method" is not limited to formal science in its application.

The next thing I wish to present for your consideration is that, in the work you are doing, here and elsewhere, much more than engineering is to be learned-- mere engineering knowledge and technical dexterity are not, after all, to be the main results of the two years or more of postgraduate work, for that would be of little use to you as individuals or to the service. You must learn how to think and you must increase your ability to tackle any problem, whether an engineering problem or not.

About 1911, when Rear Admiral Cone, now retired, was Chief of Bureau of Steam Engineering, he said, of those officers who were then being specially educated in marine engineering, that he didn't care whether they did any engineering duty or not, that their in-

creased mental development and capacity should yield large dividends to the service, in any duty they might be assigned to.

This idea may seem somewhat radical at first glance, but a little reflection will show that it is eminently sound and far-seeing. The mental training you receive is of vastly more importance to yourselves and to the service than the acquisition of engineering knowledge alone. If you can analyze and then solve problems in your specialty you have only to employ the same methods - note that I say the same methods and not the same means - to problems in strategy or tactics or logistics or in any other professional field to analyze and solve them. You will have become in fact and truth, abler and better naval officers. So I say to you, do not let yourselves be swamped by details - look for principles - and you will be surprised at the ease with which you can tackle any problem whatever.

SOME EDUCATIONAL "AIDS"

While in charge of the school, I had occasion to note the difficulties encountered by student officers in their work here and to recall the difficulties of some of my own class-mates while in the Naval Academy and of midshipmen generally when I was an instructor here in 1906 - 1908. Too many of them tried to memorize what was in the book - they "parroled" their lessons - they didn't know "how to study".

When I was a first classman, I remember very well that a member of the same section in Ordnance and Gunnery misunderstood the subject he was given. He wrote on the board the history of the development of armor - with dates, places, and names all duly mentioned. And I recall that the instructor treated him to an impressive exhortation on the sinfulness of wasting his time in memorizing what was so obviously of small importance.

Investigation showed that some small effort was, some six years ago, being made in a few colleges to deal with this very common trouble, but none of the remedies proposed seemed to get down to bed-rock. Through circumstances too complicated to tell of here, it was found impracticable to arrange adequate means of dealing with the difficulty. It must suffice to say that the conclusion was reached that the teaching of "how to study" should begin immediately upon entry into the Naval Academy, i.e. while he is a midshipman and a plebe.

Two practicable exercises were got hold of which promised good results. You can try them for yourselves. These exercises are to be considered in the nature of drills.

(a) First, - take a paragraph of any text and require yourself to re-state it in your own words; don't use any word in the original paragraph if you can possibly help it.

(b) Second, - take a paragraph of any text and require yourself to express the gist of it in not more than ten words; put it in two or three words if you can.

The first exercise is intended to remove "parroting" and the second to develop the habit of going after the kernel of the matter.

When the School was re-opened in 1919, some few of the officers whose education was cut short by the war were sent back to complete their work. They aroused my interest by asking if a certain course in "English" was to be continued and indicated their desire to continue it. In looking into the subject, a way was found to improve this "English" course, whose purposes was to help

student officers to express their ideas. This text-book used in Harvard University were found two chapters of which use could be made. One of these chapters dealt with "briefing" as used by lawyers. That is, the orderly setting-down under heads and sub-heads of the several points of a case or, in other words, methodical analysis of a proposition. We adopted that chapter with the idea that lawyers should not be allowed to monopolize "briefing" - and submit that there is no professional or practical field from which we may not adopt methods or means which will be to the advantage of the naval service.

Some years ago, when advocating a particular change in certain methods used in the Navy, I used to mention the fact that the proposed method had long been employed in the Army. At least one officer of high rank scorned this argument saying, in effect, that we should not copy the Army but stick to our own methods. I believe that such an idea is entirely wrong and that the real test is to adopt any method or practice which meets Navy needs to better advantage - and it doesn't matter whether they have been developed by the Army or commercially or by a "tin soldier" school.

SCOPE OF USEFULNESS.

Now to return to the purposes of postgraduate technical education, we repeat that it has more than mere engineering knowledge for its aim. Breadth of application is to be expected, and increase of perspective is hoped for. These Saturday morning lectures, as you know, are by no means confined to engineering or material matters - psychology, economics and other similar topics have been presented for your interest and attention for the purpose of broadening out your view-point, and, frankly, with the hope that you will, on your own initiative, begin to look about you and see what is going on in the world, especially those things that directly or indirectly affect the naval officer's profession. Don't let yourselves become limited in usefulness by the special engineering knowledge you are acquiring.

For your particular information and guidance as to the prospective scope of your future usefulness in the Navy, mention may be made of some of the officers who have "done time" in postgraduate work of one kind or another and have now attained to positions of greater or less prominence in the service: - Rear Admiral Bloch - Chief of Bureau of Ordnance; - Captain Kimberly, Commanding Huron; - Captain Brinser, Commanding Rigel and Destroyer Base, San Diego; - Captain Doyle, First Commanding Officer of Aircraft Carrier Langley; - Captain H. E. Cook, Commandant of Midshipmen; - Captain J. O. Richardson, a marine engineering P.G., Assistant Chief of Bureau of Ordnance; - Captain G. J. Meyers, a marine engineering P. G., Staff of Army College; - Commander J. O. Fisher, a former Head of Postgraduate School; - Commander Rowan, Commanding a Submarine Division; - Commander W. S. Anderson, Head of Department of Ordnance and Gunnery of the Naval Academy; - Commander W. R. Furlong, one of the first radio P.G.'s - now in the section of "policy" in the office of Chief of Naval Operations.

"MATERIAL" NOT EVERYTHING.

Do not forget, in pursuing your studies of engineering, which is today, chiefly material, that the chiefest study of mankind is man - and that all of your hardy-won engineering capacity is of little avail without the loyal co-operation of officers and men. In this connection I would commend to your consideration the careful reading and re-reading of five books, which haven't a vestige of a formula between them:-

From Sail to Steam - Rear Admiral Mahan.
Stonewall Jackson and the Civil War - Colonel
Henderson
Life of Farragut - Rear Admiral Mahan.
Psychology and the Day's Work - Swift.
Abraham Lincoln - Lord Charrwood.

In fact, I would recommend that each of you get and keep these books for yourselves.

FUTURE OF NAVAL EDUCATION.

Now, as to the future of education for officers in the naval service. About five years ago, a board was appointed by the Bureau of Navigation to inquire into and make recommendations as to the education of commissioned officers. For good and sufficient reasons, which duly appeared in their report, they recommended, in effect, that every commissioned line officer should receive at least three separate years of schooling after being commissioned, at intervals during an expected length of service of forty years.

In the Army there are three categories of officers - company officers (to captain), field officers (to colonel), and general officers. In the Navy, there are four categories of officers - division officers (to lieutenant, heads of departments (to commander), commanding officers and flag officers. Every Army officer who reaches the rank of general officer will have passed through from three to five years of schooling after commissioning - school of his arm as a company officer and again as a field officer, the school of the line and general staff school at Leavenworth and the general staff college in Washington.

The board assumed, as the Army had already done, that the graduate of the Naval Academy was not "the complete naval officer", but was only prepared to begin the practice and pursue the study of his profession. Once commissioned, he was expected to spend at least five years at sea. Between the fifth and tenth years after commissioning, he was to take the "general line course", of which I shall say more later. While high up in the grade of Lieutenant-commander, just before reaching command rank, he was to take the junior war college course. While in the rank of Captain, before becoming a flag officer, he was to take the senior war college course.

Of these two latter proposals, I will say on this occasion that the junior war college course was put into effect about two years ago, so that there remains of these recommendations only those affecting the "general line course" which are not yet under-way.

I will just state, at this point, that postgraduate technical instruction, such as you are now engaged in, was to begin immediately upon completion of the "general line course" itself, which was to be obligatory for all line officers.

Now, what was the "general line course"? It was to consist of three main parts:-

(a) A thorough review of all work done as first class in the Naval Academy. This review, after five years at sea, was expected to improve and fix the general knowledge of the profession.

(b) A thorough grounding in communications, organization, administration, supply and the elements of strategy, tactics, logistics and policy.

(c) A general knowledge of economics, government, speaking and writing, sociology, and psychology to broaden the viewpoint.

The "general line course" was to be followed by (1) post-graduate technical education or (2) specializing practical courses in torpedoes, submarines, aviation, communications, marine engineering, gunnery, etc. "Specialization" in all the requirements of naval officers. All line officers must have a good working knowledge of electricity, steam, radio, ordnance and naval construction-engineering matters - but we rely on you for the expert knowledge. Similarly, all officers must have a good working knowledge of codes and ciphers, gunnery, seamanship, navigation, military law, etc., but we need "specialists" also in each and every subject that bears on the naval profession. The idea is that every officer, whether postgraduate or not, shall have at least a "side-line", or "hobby" in which he is an expert and an authority. The great value of such a state of affairs to the service is obvious.

The "general line course" itself has not yet been started but there is fair hope that it will be begun eventually. You gentlemen will never take it, but you have still ahead of you the prospect of the two war college courses in due time.

I may add, further, in regard to the "general line course" that it affords a ready means of relief for the always crowded condition of the Naval Academy curriculum. The recent inclusion of practical aviation emphasizes this state of affairs. Instead of increasing the Naval Academy course to five years, it is believed that if we will accept the idea that the graduate of the Naval Academy is not yet the "complete" naval officer, it is extremely likely that he can do five years at sea with advantage to himself and to the service, if he is then made to take the "general line course".

SUMMARY.

In closing I wish to repeat that you must realize:-

- (a) That principles are few and applications are innumerable.
- (b) That a main result of your postgraduate work is to be increased mental capacity and consequent ability to tackle any kind of a problem.
- (c) That attention to material matters must not preclude attention to personnel considerations.
- (d) Learn to think - learn to analyze - learn to look before you leap - apply scientific methods in all things.

Lastly, I recommend that you pattern yourselves, as engineering specialists of one kind or another, on those officers who though trained as officers of the old engineer corps, elected to qualify, after 1899, for all of the duties of the line - seamanship, navigation, tactics, leadership, gunnery - and have become distinguished officers of all-around abilities. I cannot forbear to mention three of them as examples of that success which you should strive to emulate in a professional way. One of them is Vice Admiral McKean, now Commander of the Scouting Fleet; another is Rear Admiral Robison, Chief of Bureau of Engineering; the third is Read Admiral Louis M. Nulton, now Superintendent of the Naval Academy.