



RINA AFFAIRS

OCTOBER 2009

The Newsletter of the Royal Institution of the Naval Architects

CHIEF EXECUTIVE'S COLUMN



Next month will see the start of the careers of many naval architects as first year students at universities and colleges in the northern hemisphere join those in the southern hemisphere who have already started their naval architecture related courses. A large number of students at the now 60 + universities and colleges where the Institution has links through membership of staff and students will benefit over the next 2 to 4 years from the Institution's policy of encouraging their membership and active involvement as Student Members.

As Student Members, some will enjoy free membership during their time at university or college and all will receive the Institution's journals. They will also enjoy many other benefits such as the increased number of free places at RINA conferences, sponsored by both industry and the Institution. (The Institution continually seeks to increase the number of sponsored places – members who think that their companies would be willing to sponsor a place should contact the Chief Executive for further information) Some will receive the RINA scholarships, prizes and awards, including the RINA Student Naval Architect Awards. These Awards, which are also sponsored by industry, recognise academic excellence of both undergraduates and postgraduates, and are now presented at 39 universities.

Having experienced the benefits of membership whilst at university or college, hopefully Student Members will recognise the value and importance of membership of the Institution to their professional development and future careers, and continue their membership when they start to receive annual fees notices as Associate Members. However, the Institution recognises the financial pressures on newly graduated members, and the first fee will not be due until 1 January of the year following graduation. Those who continue in full-time study as Associate Members will receive a 50% reduction in their membership fees.

Associate Members will find that employers world-wide recognise the added value which membership of the Institution provides. They will welcome the early commitment to achieving the Institution's high professional standards that membership demonstrates, and in the longer term, both industry and the naval architecture profession will benefit from members' implicit acceptance of the requirement to continue their professional development throughout their working lives.

The Institution's policy with regard to the younger members of the Institution continues to represent a significant investment in the future of both the Institution and the naval architecture profession. However, I am sure that none would doubt its wisdom and necessity. The Institution is grateful to members of staff at the universities and colleges for encouraging students to become Student Members, and for their support of the Institution's various awards.

And finally, may I remind all members with sons and daughters (or nephews and nieces, grandsons and granddaughters) still at school and who may be contemplating a career as naval architects, or just have an interest in maritime matters, that they would be most welcome as Junior Members. I am sure that their interest would be maintained by receiving the Institution's journals each month. Annual Fees of £20 can be charged to members.

Chief Executive

IN THIS ISSUE

2009 President's Invitation Lecture

The 2009 President's Invitation Lecture will be presented on 11 Nov 2009 in London, by Martin Stockford, Managing Director of Clarksons Research.

2010 Events

The full 2010 Events Programme is now published.

New Members

An open letter from the Chief Executive to all members seeks their support in encouraging others to follow their lead in becoming members of the Institution.

Letters to the Editor

Information is requested about the Lake Windermere Steam Launch 'Dolly', and past members Lt Col Howard Baskerville Cadogan RNR, Edward Charles (Cockburn?) Johnstone and James Stafford. Can you help?

Awards and Scholarship

The achievements of Student Members in France, Indonesia and the UK are recognised by the presentation of Student Naval Architect Awards and RINA Scholarships.

Sir Phillip Watts, KCB, ILD, DSc, FRS

Members visiting Headquarters will have often passed the two busts which stand in the foyer. The more observant will have noticed that one is a memorial to Sir Phillip Watts – but who was Sir Phillip Watts, to deserve the honour of greeting members to Headquarters?

BMF Technical Report

The Sep issue of the British Marine Federation Technical Report is now available on the RINA website.

Maritime Directories

Members' services, links to maritime sites and maritime courses are listed in the online Maritime Directories.

RINA – Bureau Veritas Student Naval Architect Award

ENSIETA

The 2009 RINA-BV Student Naval Architect Award was presented to Arnaud Trouvé who was adjudged to be the outstanding final year student on the on the Naval Architecture and Offshore course the Ecole Nationale Supérieure des Ingénieurs des Études et Techniques d'Armement.

Having been presented with the Award,

Arnaud Trouvé receives his Diploma from the hands of M. Jouanjean, ENSIETA Director.



RINA Student Naval Architect Award

IIT Madras

The 2009 RINA Student Naval Architect Award for the best final year project on the BTech course at the Indian Institute of Technology Madras has been presented to Siddhartha Deb for his project “Wave Flume Experiments on the Performance of an Oscillating Water Column Wave Energy Device”.

IIT Kharagpur

The 2009 RINA Student Naval Architect Award for the best final year project on the Bachelor of Technology course at the Department of Naval Architecture and Ocean Engineering at the Indian Institute of Technology, Kharagpur has been presented to Homam Raavi for his project “Comparative study of the resistance of a container ship with bulbous bow and X-bow design using SHIPFLOW”.

CORRECTION

Observant members will have noticed that the ship on page 10 of the September issue of RINA Affairs was HMS *Prince of Wales*, and not HMAS *Sydney*, as captioned.

Royal Institution of Naval Architecture Scholarships

Strathclyde and Glasgow Universities

RINA Scholarships have been awarded to Djanani Balacoumarane and Gurpreet Singh Sandhu, who were considered to be the best First and Second Year students.

Plymouth University

RINA Scholarships have also been awarded to Jenifer Wales and David Evans for thier outstanding first year results at Plymouth University.

RINA - PT DPS Student Naval Architect Award

The 2009 RINA - PT DPS Student Naval Architect Awards at ITS Surabaya have been presented to I Putu Agus Ariyadi (Naval Architecture and Shipbuilding Engineering); Yogi Pramadika (Marine Engineering) and Nur Ramlie Rakhmadan (Ocean Engineering).

Additions to the library

The Sinking of HMAS Sydney

Recent additions to the Denny library include the Report of the Technical Aspects of the Sinking of HMAS Sydney and HSK Komaran, presented to the HMAS Sydney Commission of Enquiry by the Defence Science & Technology Organisation and the Royal Institution of Naval Architects in July 2009.

On 19 November 1941 HMAS Sydney, under the command of CAPT Joseph Burnett RAN, was returning from having escorted HMAT Zealandia to a location near the Sunda Strait. When about 200 kilometres from the coast of Western Australia, en route to Fremantle, Sydney sighted a vessel and diverted from her course to investigate. The vessel was the raider Komaran, which was disguised as MV Straat Malakka. Sydney and Komaran engaged in battle, and both sank.

Of the 645 officers and crew on board Sydney, no one survived. Of the 395 officers and crew and four Chinese laundrymen on board Komaran, 318 survived. The rescued Komaran survivors were interrogated but, there being no Australian survivors to confirm or deny the Germans' account of the engagement, some people were unable to accept their version of the engagement. Controversy arose and has continued. At issue were the location of the battle, why Sydney had been sunk by Komaran, and why there were no survivors from Sydney.

Location of the wrecks in March 2008 led to the uncovering of much new evidence, which meant that rational answers could now be given to many of the questions raised in the controversy.



HMAS Sydney

New on

www.rina.org.uk

British Marine Federation Technical Reports

The September issue of the British Marine Federation Technical Report is now available on Recreational Craft section of the Technical Forum at www.rina.org.uk/TechnicalForum/News.

British Marine Federation Reports now incorporate BMF Manufacturing Newsletters and Technical Reports cover developments in the Recreational Craft Directive (RCD), Boat Safety Scheme (BSS), as well as related activities of the UK Maritime & Coastguard Agency and the UK Health & Safety Executive. (RINA Members must login to access BMF Newsletters and Technical Reports). BMF manufacturing Newsletters and Environmental Updates are now included in Technical Reports.

BMF Technical Reports are published on the RINA website (members only) with the permission of the BMF.

NEW MEMBERS - AN OPEN LETTER TO ALL MEMBERS

Dear member,

As a member, you will be aware of the benefits and service which membership of the Royal Institution of Naval Architects provides. In particular, you will be aware that membership provides a professional qualification which is recognised throughout the global maritime industry as demonstrating the achievement of the highest standards of professional competence and integrity. You will also be aware that membership provides access to information on developments in all aspects of the maritime industry through the Institution's international conferences and publications which members receive free or at a reduced cost.

I am therefore writing to ask for your support in encouraging your colleagues to follow your lead in becoming a member of the Royal Institution of Naval Architects and enjoying the benefits of membership of the world's leading professional institution for those involved in the design, construction and maintenance of marine vessels and structures at all levels. I would be grateful if you would let me know (by email to hq@rina.org.uk) the name, position and email address of any of your colleagues who you would wish to introduce as a member. Such potential members could include those at any stage in their career, whether newly graduated or more senior and experienced.

In return for your assistance I would be pleased to offer you a year's free subscription to the Institution's Transactions (the International Journal of Maritime Engineering and the International Journal of Small Craft Technology) or any of the Institution's other journals, following the application and election of anyone you might propose, in any class of membership except Student Member.

Chief Executive

Small Craft Committee News

At a recent meeting of the Small Craft Committee, Nigel Shaw, CEN Consultant, gave a presentation on Recent Development in standards in the Recreational Craft Sector. The presentation can be seen at www.rina.org.uk/SmallCraftCommittee/News or www.rina.org.uk/TechnicalForum/News/RecreationalCraft (pdf file)

Visitors to Headquarters

Recent visitors to Headquarters included Mr Albert Lo, Honorary Secretary of the Hong Kong Joint Branch.

Also visiting Headquarters for the first time was Mr William H. Gazarke, Chairman of the SNAMR Marine Forensic Committee. Mr Gazarke late gave a presentation to the London Branch on *The Loss of HMS Prince of Wales*.

Chief Executive welcomes Mr Albert Lo to RINA Headquarters.



NAVAL DOCKYARDS SOCIETY

2009 Conference

Building Victory – Mid-18th Century Naval Warfare - Roles of Dockyards and Shipbuilding

7 Nov 2009

Royal Naval Museum, Portsmouth

2009 is the 250th anniversary of the laying of the keel of HMS *Victory* in No.2 Dock, Chatham on 23rd July. To celebrate this event, the Naval Dockyards Society will hold a conference on the building of HMS *Victory*, mid-18th Century naval warfare and the roles of dockyards and shipbuilding.

Details of the conference may be found on the Naval Dockyard Society's website at www.navaldockyards.org or from the Secretary of the Society at ann.coats@port.ac.uk

port.ac.uk

2010 CONFERENCE AND TRAINING PROGRAMME

PACIFIC 2010 – INTERNATIONAL MARITIME CONFERENCE

27-29 Jan, Sydney, Australia

www.rina.org.uk/pacific2010

MARINE & OFFSHORE COMPOSITES

3-4 Feb, London, UK

www.rina.org.uk/composites2010

MARINE & OFFSHORE COATINGS

17-18 Feb, London, UK

www.rina.org.uk/marinecoatings2010

SHIP DESIGN & OPERATION FOR ENVIRONMENTAL SUSTAINABILITY

10-11 Mar, London, UK

www.rina.org.uk/environmentalsustainability

FUNDAMENTALS OF CONTRACT & CHANGE MANAGEMENT FOR SHIP CONSTRUCTION, REPAIR & DESIGN

14-16 Apr, London, UK

www.rina.org.uk/fundamentalsapril2010

MARINE RENEWABLE & OFFSHORE WIND ENERGY

21 - 22 Apr, London, UK

<http://www.rina.org.uk/renewable2010>

BASIC DRY DOCK TRAINING COURSE

11-14 May, London, UK

<http://www.rina.org.uk/drydock2010>

WARSHIP 2010: REFIT, REPAIR AND MAINTENANCE

9-10 Jun, London, UK

<http://www.rina.org.uk/warship2010>

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International Conference on Computer Applications in Shipbuilding

Sir: I would like to congratulate the Institution on the success of the ICCAS 2009 Conference in Shanghai which I attended. The event was very well conducted and presented a high quality of organisational ability for what is a very complex and difficult international event.

I particularly like to thank the RINA team of Phil Eltringham, Amber Williams and Mark Staunton-Lambert for their considerable effort in managing the conference and dealing with the politics and requirements of the conference and the Shanghai Society of Naval Architects and Marine Engineers. Their skills and professionalism in conducting negotiations, preparing programs, arranging chairmen, advising on visa's, accommodation, travel etc. ensured that the 'front of house' ran as smooth as possible whilst resolving the 'back of house' issues and problems effectively. A task that must not be underestimated.

As a Chartered Naval Architect with the Institute for 30 years I am proud that we continue to achieve the highest professional standard in everything RINA are involved in. Credit must go to the Chief Executive for his leadership of his team in achieving this standard.

John Martin C.Eng MRINA

Lake Windermere Steam Launch 'Dolly'

Sir: I am currently researching the Lake Windermere Steam Launch 'Dolly' as I want to build a working scale model of her. It is my hope to follow the prototype practice in the construction of the model including her engine and boiler etc..

My reason in contacting you is to inquire to see if the Royal Institution of Naval Architects have drawings/lines or photographs of SL 'Dolly' and also to inquire if you have drawings and photographs of her steam plant.

I take this opportunity to assure you that any help given by you will be most gratefully received and appreciated by me.

*Patrick O'Sullivan
patrick_osullivan@hotmail.co.uk*

The Institution does not hold any information on the 'Dolly'. Can any member help?

Chief Executive

Lt Cdr Howard Baskerville Cadogan RNR (1915- 1995)

Sir; I am writing to ask if the Association keeps archived records of former members.

My late father became an Associate of the Institution of Naval Architects on 5th February 1948 and I am trying to find out more about his life in this period.

I know that he used to work for Semtex, which I believe supplied decking materials for ships, but I'm not sure when he joined that company.

If you can be of any assistance, this would be much appreciated

*Peter Cadogan
peter.cadogan@zen.co.uk*

Other than confirming that Lt Cdr Cadogan was elected as an Associate in 1948, no information is held about him. Can a member help?

Chief Executive

Edward Charles (Cockburn?) Johnstone

Sir; I am trying to trace information about my grandfather on my mothers side of our family. All searches to date have been

negative. However he is shown on my mother's marriage records as having the profession of Naval Architect. On my grandmother's death record he is shown as a Ship's Draughtsman. On each of these records there is a name discrepancy. The names shown are Edward Charles Johnstone and Edward Cockburn Johnstone.

My grandmother was born in 1869 and so therefore I am assuming he too was born around the 1860's. I know that he moved to the USA in the early 1900's. My mother told me he had designed the floating dock in Liverpool although I have no idea as to the authenticity of this.

Can you tell me if he was a member of your organisation and do you have any information you could pass on. I would be very grateful.

*Millar J Ratray
ratray@metronet.co.uk*

Mr Johnson was not a member of the Institution, but can any member help?

Chief Executive

James Stafford

Sir: I am researching a book on maritime history, and wish to have some information of a former member of the RINA. James Stafford, from Ireland, attained associate membership at some time in the early 1940s as far as I can make out. Would you be so kind as to look up your records and perhaps let me have the date of his attaining A.R.I.N.A., and of course any other biographical details would be appreciated. Mr Stafford died in Dublin on 13 May 1968. He was unmarried, and I have failed to find any close relatives.

Thanks, in anticipation.

*Patrick J. Conaghan
patrickconaghan@hotmail.com*

Mr Stafford is first listed as an Associate of the Institution in 1953. He was still listed in the membership roll published in the

1971 and he wasn't acknowledged to be deceased until the 1972 Transactions, No further information is held. Can any member help?

Chief Executive

Short & Fat v Long & Thin

Sir; I recall that, in the nineteen-eighties, there was much debate about the merits and demerits of short-fat vessels vs long-thin vessels.

I feel sure that there were papers published on the subject in the RINA Transactions. However, I have been unable to turn up anything in the index of publications online. Can any member point me in the direction of any published information on the debate or the subject?

Phil Helmore

p.helmore@unsw.edu.au

THOUGHTS FOR THE MONTH

It's not the towering sail, but the
unseen wind that moves the ship
English Proverb

He that would learn to pray, let him
go to sea.
English Proverb

Smooth seas do not make
skillful sailors.
English Proverb

The ship that will not obey the helm
will have to obey the rocks.
English Proverb

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INNOVATION IN HIGH PERFORMANCE SAILING YACHTS (INNOV'SAIL 2010)

30 June – 1 Jul, Lorient, France
[http://www.rina.org.uk/
innovsail2010](http://www.rina.org.uk/innovsail2010)

WILLIAM FROUDE CONFERENCE
Theoretical & Applied Hydrody-
namics – Past and Future
22-23 Sep, Portsmouth, UK
[http://www.rina.org.uk/
Williamfroude](http://www.rina.org.uk/Williamfroude)

**INNOVATIONS IN
HIGH SPEED CRAFT**
Oct, London, UK
[http://www.rina.org.uk/
highspeedcraft2010](http://www.rina.org.uk/highspeedcraft2010)

**FUNDAMENTALS OF CONTRACT
& CHANGE MANAGEMENT
FOR SHIP CONSTRUCTION,
REPAIR & DESIGN**
Oct, London, UK
[http://www.rina.org.uk/
Fundamentalsoct2010](http://www.rina.org.uk/Fundamentalsoct2010)

PRESIDENTS INVITATION LECTURE
Nov, London, UK

**SYSTEMS ENGINEERING IN SHIP
& OFFSHORE DESIGN**
3-4 Nov, London, UK
[http://www.rina.org.uk/
systemsengineering](http://www.rina.org.uk/systemsengineering)

**INTERNATIONAL
CONFERENCE ON SHIP &
OFFSHORE TECHNOLOGY**
Nov, Surabaya, Indonesia

DEVELOPMENTS IN MARINE CFD
Dec, London, UK
[http://www.rina.org.uk/
marinecf2010](http://www.rina.org.uk/marinecf2010)

2009 PRESIDENT'S INVITATION LECTURE

The 2009 President's Invitation Lecture will be presented by Martin Stockford, Managing Director of Clarksons Research, part of Clarksons – one of the world's leading provider of financial services and market intelligence. As such, Martin is ideally placed to give an authoritative view on the challenges facing the global shipping industry.

RINA AFFAIRS

The Institution is not, as a body, responsible for opinions expressed in RINA Affairs unless expressly stated that these are Council's views.

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Long serving Executive Officer of the Australian Division retires.

Keith Adam has retired after 14 years as the Executive Officer of the Australian Division. During that time, Keith's support to the Council of Division and to the Organising Committee of the Pacific

International Maritime Committee has been invaluable. The Councils of both the Division and the Institution are indebted to Keith for his significant contribution to development and success of the Institution's activities in

Australia.

Keith's successor as the Executive Officer will be Rob Gehling. Rob is a past President of the Australian Division and member of the Council of the Institution.

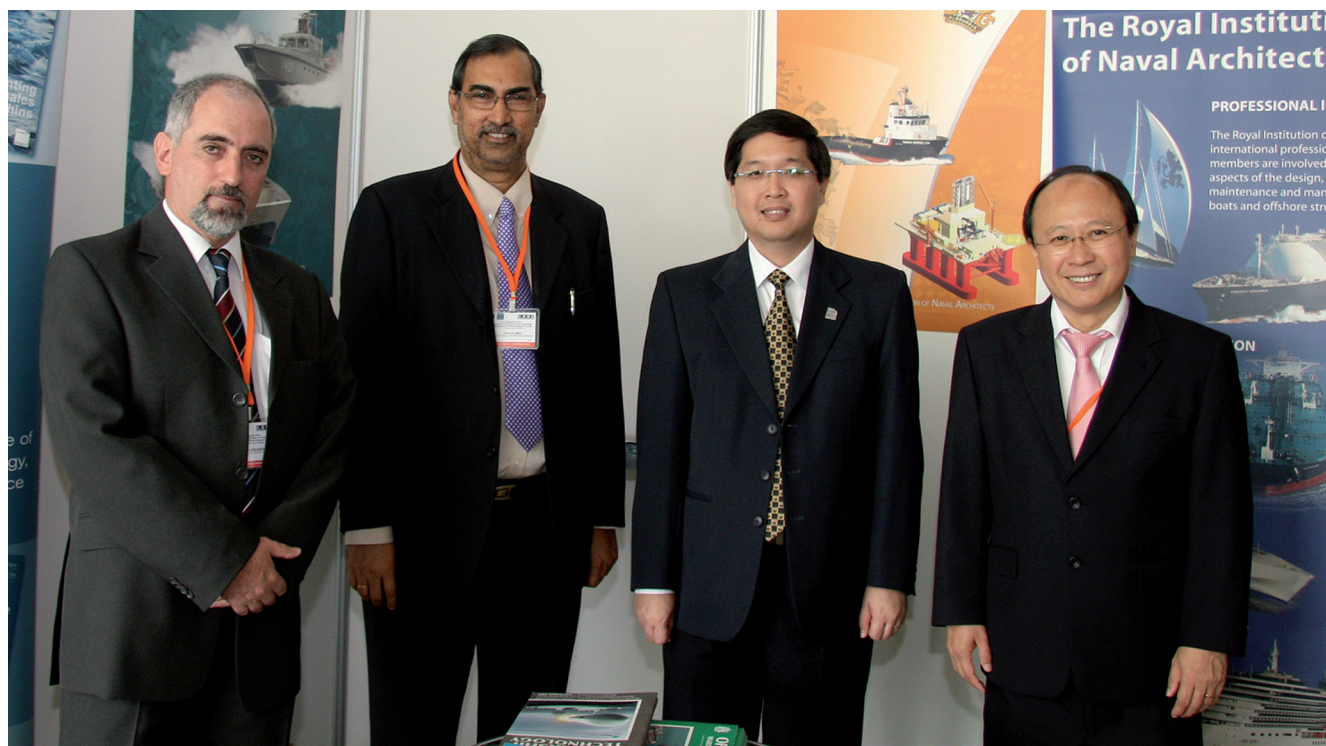
Singapore Joint Branch hosts successful "OSV Singapore 2009" conference

The Joint Branch of the RINA and the IMarEST (Singapore) along with CORE (Centre for Offshore Research & Engineering), NUS hosted

the 3rd in the series of international conferences on Technology and Operation of Offshore Support Vessels. The 2-day event conference and accompanying exhibition provided a platform for ship designers, shipbuilders, owners & operators, manufacturers & suppliers, classification societies, etc. to present and discuss future needs and challenges, as search for hydrocarbons moves into deeper waters as well as into arctic frontiers of oil & gas exploration.

"OSV Singapore 2009" also provided an excellent opportunity for various machinery & equipment manufacturers, maritime professionals, shipyards, classification societies, regulatory bodies and academics to increase international contacts and cooperation to stimulate progress in design and production technology for higher efficiency, better economy, improved safety and environment awareness of offshore support vessels.

Mr. Rasim Asgarov (Singapore JB Council member), Dr. Arun Dev (Singapore JB Chairman & Chairman of the Conference), Mr. Lam Yi Yong (Chief Executive, MPA and Guest of Honor at the Conference) and Prof. Choo Yoo Sang (Immediate Past President of IMarEST and Advisor of the Conference).



The opening ceremony was attended by about 200 participants, many of them from marine and offshore industry. Guest of Honour was Mr. Lam Yi Young, Chief Executive, maritime and Port Authority of Singapore. Among other dignitaries were Dr. Choo Chiau Beng, FRINA, CEO of Keppel Corporation, Mr. Tong Chong Heong, FRINA, CEO of Keppel Offshore & Marine, Mr. Goh Boon Kiat, FRINA, Director, KOMtech, Prof. Lim She Chun, Deputy Dean, NUS Engineering Faculty, Mr. David Chin, Executive Director of Singapore Maritime Foundation, Mr. Kenneth Kee, President, Society of Naval Architects & Marine Engineers Singapore (SNAMES) and Mr. David Kinrade, President, FIMarEST, SEAD IMarEST.

The opening ceremony address was delivered by the Conference Advisor Prof. YS Choo, FRINA, FIMarEST, Past President of IMarEST followed by a welcome address by the Conference Chairman Dr. Arun Kr. Dev, FRINA, FIMarEST, Director, Newcastle University Marine International (NUMI)-Singapore. Finally, Guest of Honour Mr. Lam Yi Young delivered his speech. The opening session ended with an excellent keynote speech by Mr. Haavard Stave, Deputy Managing Director of Ulsteingroup, Norway. The technical session was chaired by Mr. KP Tan, FRINA, Director, Centre of Innovation, Ngee Ann Polytechnic, Singapore.

A total of 15 technical papers were presented at the conference, covering design & safety, propulsion & propellers, dynamic positioning, classification and statutory requirements for safety & environment, critical components of OSVs, CFD application in design of propellers, etc. Authors were from China, Finland, India, Japan, Germany, Norway, Singapore, UK and USA. The 160 delegates came mainly from local shipyards, sponsoring companies, OSV operators, OSV machinery & equipment manufacturers and academic institutions.

The conference was sponsored by Keppel Singmarine, Ulsteingroup,

Wartsila Propulsion, ABB, DNV, MAN Diesel and Voith.

London Branch Technical Meeting

“The Loss of HMS Prince of Wales”

Mr William H. Garzke, Chairman of the Marine Forensic Committee gave a paper to a meeting of the London Branch, in which he presented the results of an exhaustive analysis of the loss of HMS *Prince of Wales*, combining the fruits of decades of research and analysis.

HMS *Prince of Wales* was doomed by a torpedo hit on the on the outboard port propeller strut, which wrecked the stern tube, tearing a massive hole which permitted the exploration of several compartments along the shaft alley. The battleship rests upside down in some 68 meters of water. The gaping opening in the stern, caused by the devastation of the stern tube structure, permitted an aggressive diver to make his way inside the ship to the after bulkhead of the diesel dynamo room, a distance almost a third of the length of the ship! The

massive extent of the damage along the length of this shaft alley explains why the battleship was doomed by this one torpedo hit. There are four failures in the structure of this one propeller shaft, which has fascinated and puzzled all who consider how this dramatic event could have occurred.

Click here to view Mr Garzake's presentation (MWPowerpoint) or to read his paper (pdf file).

“NAVAL WAR HORSES”

“Naval War Horses” is a documentary on Naval submarines which can be viewed on Web TV on by logging on to www.video.marinebiztv.com

Web TV has a rich collection of information (Archive Programs), which may be accessed with the username: **biztv** and password: **aries**

HMS *Prince of Wales*.



**Sir Phillip Watts, KCB,
LLD, DSc, FRS**

Members visiting Headquarters will have often passed the two busts which stand in the foyer. However, only the more observant will have noticed that one is a memorial to Sir Phillip Watts, the distinguished naval architect, presented by and subscribed to by members of the five societies with which Sir Phillip was associated – the Worshipful Company of Shipwrights, the Royal Society, the Smeatonian Society of Engineers, the Institution of Civil Engineers and the Institution of Naval Architects. And even fewer members will be aware that the bust was received on behalf of the Institution of Naval Architects in 1928 by the Right Hon. Winston Spencer Churchill, CH, MP, then Chancellor of the Exchequer and previously First Lord of the Admiralty.

Sir Phillip Watts was born in Portsmouth in 1846. His father was a principal constructive officer in the Royal Dockyard. In 1860, he was apprenticed as a shipwright there, when he attended the Dockyard School. As a result of successful studies there, in 1866 he was selected to attend the Royal School of Naval Architecture at South Kensington. In 1870, he was appointed to assist the Admiralty in making various calculations in connection with the design of new ships. In this capacity, he used his scientific knowledge by calculating the proper sizes of various parts of a ship's structure, and did much to assist in breaking down the tradition of long standing, of determining the scantlings of many parts by custom or precedent. He was later to be appointed to assist William Froude in his investigations into the laws relating to the resistance and propulsion of ships.

Following his service with William Froude, he was appointed as assistant constructor at Pembroke Dockyard, following which time he returned to the Admiralty Staff, and organised what was then called the "Calculating Section", and for some years all Admiralty detailed calculations of a scientific nature were carried out under his supervision. During this time, the special vessel *Polyphemus*



was designed. Her very small reserve of buoyancy made it a matter of the greatest importance that all the calculations relating to her flotation, metacentric height, range of stability etc. should be very accurate. There were also special problems involved in armouring the turtle-backed shape of the upperdeck.

He was later responsible for inventing what became known as "water chambers" for the purpose of moderating the rolling of ships such as the *Inflexible* which required to have a very large metacentric height in the undamaged condition.

Shortly afterwards, he was appointed constructor at Chatham Dockyard, until he retired in 1885 from Admiralty service to become in succession to Sir William White, naval architect and general manager to Sir W G Armstrong & Co at Elswick. During his time at Elswick, he was responsible for the designing and building of warships for both the Admiralty and foreign powers, including HMS *Victoria*, the first battleship built at Elswick.

He left Armstrong in 1902 to become Director of Naval Construction. It was

during this time when the *Dreadnought* was designed and built, and it is perhaps in connection that this vessel more than any other that Sir Phillip laid claim to be one of the world's greatest naval designers. It was also during this time that he came into close association with Sir Winston Churchill, then First Sea Lord of the Admiralty.

Sir Phillip retired as Director of Naval Construction in 1912. No predecessor in this important office had had his new designs brought to such a severe test in war, twenty-nine of his battleships and battle cruisers being engaged at Jutland.

He became a member of the Institution in 1873, was elected Member of Council in 1885, Vice – President in 1901 and was made an Hon. Vice-President in 1916. He contributed ten papers to the Transactions of the INA, including two papers of encyclopaedic magnitude, i.e. "Fifty Years of War Shipbuilding" in 1911 and "Ships of the British Navy on 4 August 1914", in 1919. He died in 1926.

A full account of the career of Sir Phillip Watts is published in the 1928 Transactions of the Institution of Naval Architects.