

Pejo Bročić\*, Ivana Kordić\*\*, Emin Sarajlić\*\*\*,

## **Archives of nautical charts and publications, HHI museum in its formative stage**

*Keywords:* museum; cartographic heritage; old methods of chart production; 150-year long production of navigational charts

### *Summary:*

The Hydrographic Institute of the Republic of Croatia (HHI) is successor to the Hydrographic Office of the Austro-Hungarian Navy established in Trieste in 1860. This year marked the beginning of an organised hydrographic survey in Eastern Adriatic. Throughout its 150-year long production of navigational charts and publications, the Hydrographic Institute has built valuable collections of its own charts at different scales and nautical publications. It also keeps in its holdings nautical charts received on an exchange basis from related institutions both in Europe and worldwide, covering not only Eastern Adriatic but also other sea areas all over the world.

As the chart production and hydrographic survey are heading towards new technologies, the idea of a HHI museum has been devised in order to preserve its cartographic heritage and old methods of chart production. Layout of the museum will include historical charts, old instruments and aids, materials formerly used in the process of chart production from the hydrographic survey to the final product. The museum, to be situated in the HHI building, will give its visitors an insight into the past and present of nautical cartography.

### **Introduction**

*Hydrography* is the branch of applied science which deals with the measurement and description of physical features of the navigable portion of the Earth's surface.

*Hydrographic* activity includes hydrographic survey, oceanographic research, and nautical cartography shaping the data into nautical charts or publications.

As prescribed by law, in Croatia the hydrographic activity is performed by the Hydrographic Institute of the Republic of Croatia (HHI), based in Split, whose mission is to carry out scientific-research, development and professional works related to the safety at sea, hydrographic-and-geodetic survey of the Adriatic, marine geodesy, design and production of charts and nautical publications, oceanographic research, submarine geology, and finally publishing-and-printing activities.

The HHI is responsible for the development of navigational safety service in the Adriatic Sea, according to the recommendations of:

- International Hydrographic Organisation (IHO),
- International Maritime Organisation (IMO),
- International Association of Lighthouse Authorities (IALA),

and in cooperation with the Ministry of the Sea, Transport and Infrastructure, the Croatian Navy, port authorities, lighthouse authorities, and hydrographic offices of maritime countries worldwide. One of the basic activities of the HHI is the construction, production, and maintenance of navigational charts of the Adriatic Sea.

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\* Hydrographic Institute of the Republic of Croatia, Split [pejo.brocic@hhi.hr]

\*\* Hydrographic Institute of the Republic of Croatia, Split [ivana.kordic@hhi.hr]

\*\*\* Hydrographic Institute of the Republic of Croatia, Split [emin.sarajlic@hhi.hr]

A navigational chart shows a particular navigational area, and it is primarily designed to ensure safe navigation in that specific sea area. For practical application, they are constructed in the Mercator projection, and for their navigational purpose, the represented areas are given at different scales including different quantities of data needed for that purpose.

All measured and processed data are stored in the Archives of original charts, or in the HHI database. The Archives keep cartographic originals of all printed charts, as well as the data obtained from hydrographic-geodetic measurements conducted throughout the 20<sup>th</sup> century. The Hydrographic Institute has a library preserving about 8000 books, textbooks, and periodicals, collected over the years, or received on an exchange basis from other institutes all over the world. The Hydrographic Institute of Croatia continues the 150-year tradition of an organised hydrographic activity in the Eastern Adriatic Sea.

### **Historical development of the Hydrographic Institute**

In the Adriatic Sea, shipping was developed as far back as the age of the ancient Phoenicians, Greeks, Carthaginians, Illyrians, Romans, Arabs, and Byzantines, many records of which provide evidence for the development of sciences aimed to improve navigation. The first scientifically based hydrographic measurements in these parts were conducted by France in the times of Napoleon, managed by Charles Beautemps-Beaupré (1766 –1954), a French hydrographer and cartographer, engineer of the Chart Depot in Paris, later to become the French Hydrographic Institute. In 1806 and from 1808 to 1809, he carried out scientifically based hydrographic, oceanographic, geomagnetic and other marine multidisciplinary investigations in Eastern Adriatic, which at those times was under French rule. The results of his work were the basis for all later hydrographic and other marine investigations in the Adriatic Sea.

Between 1806 and 1809, he made surveys in the following areas: Boka Kotorska, the area of Dubrovnik between Cavtat and Ston, the ports of Split, Šibenik, Zadar, Pula and Piran with surroundings, and Pašmanski Kanal. He determined the magnetic declination (variation) and the system of surface currents for the above mentioned areas.

After that, the first systematic survey of Eastern Adriatic was carried out between 1822 and 1824 by the Austro-Hungarian Navy, which published twenty-four charts and a pilot entitled "Portolano del Mare Adriatico".

Hydrographic activity was institutionalised on 27 April 1860 by orders of Archduke Ferdinand, commander of the Austro-Hungarian Navy, by approving the statutes of the Hydrographic Office in Trieste. The organised hydrographic activity has been continued in Eastern Adriatic to the present day, with some short interruptions.

The Hydrographic Office in Trieste had a staff of 18 full-time specialists, and a varied number of naval officers, as well as the following vessels: "Arethusa", "Saida", brig "Husar", and frigate "Venus". It would be interesting to mention the structure of the Office, as compared to the present-day Institute, having the following departments: astronomical observatory with instruments storeroom, depository of charts with a marine library, physics laboratory, and military course.

After two years, in 1862, a branch-office was founded in Pula, which in 1872 resulted in the complete relocation to the new Office building. Meanwhile, in 1866, there started a new systematic survey of the entire Adriatic Sea, while the last major survey under the Pula Office was made between 1906 and 1910.

After the First World War, the Hydrographic Office restored its activity in the newly established Kingdom of Yugoslavia, on 1 September 1922 in Tivat (today's Montenegro).

Shortly afterwards, on 21 August 1923 it became a part of the Naval Academy in Dubrovnik, and finally on 1 October 1929 it was moved to Split as an independent institution.

In that period, the major task of the Office in Split was to keep up to date the existing charts and publications. As supplies of inherited charts were low, the only and the quickest way to produce charts was copying and duplicating the existing Austro-Hungarian charts.

In this way, the following charts were published: 3 general charts (one of them at 1:1 000 000 scale, and two at 1:750 000 scale, 2 sailing charts at 1:180 000 scale, 9 coastal charts at 1:80 000 and 1:60 000 scales, 5 harbour charts at 1:15 000 and 1:3 000 scales, and 6 auxiliary charts, with all German names replaced by Croatian ones.

In 1937, Hydrographic Office was renamed the Hydrographic Institute of the Navy. At that time it had four departments: Nautical Department, Cartographic Department (besides cartographic tasks, also responsible for hydrographic, oceanographic geomagnetic measurements), Meteorological Department (carrying out the synoptic and climatological programme for 16 stations), and Reproduction Department.

In 1941, at the beginning of the Second World War, the work of the Institute was suspended, and all the material and instruments were seized by occupiers. The activity of the Institute was restored during the war, when in November 1943 the Partisan Navy Headquarters set up a Cartographic Department in Hvar, which was relocated to Vis on 1 January 1944. Almost at the same time (17 February 1944), an Hydrographic Department was formed in Monopoli (Italy), being relocated to Vis on 23 October 1944, and finally to Split where the Hydrographic Institute was founded on 6 November 1944 on the orders of the Partisan Army Command.

Immediately after the Second World War, the Institute's main task was to ensure normal navigation in the Adriatic. A part of archival materials and instruments was returned, so that it was possible to continue the hydrographic survey, measurements and analyses of the physical and chemical characteristics of the sea and climate in the Adriatic.

In general, the period between 1945 and 1991 has significantly contributed to the present activity of the Institute, as a major breakthrough has been achieved in all segments of work.

Great resources were invested in the hydrographic activity, which is evident not only from a large number of hydrographic and cartographic originals and other data kept in the Archives of original charts, but also from the scientific research work. Hydrographic survey is carried out systematically, according to the standards of the International Hydrographic Organisation (IHO).

Cartographic production has achieved a significant step forward, having moved on in a very short time from the revising of existing inherited charts to the publishing of its own charts and plans produced in a particular, still recognizable style.

Unfortunately in 1991, the Institute experienced another difficult period, when under attack of the aggressor's Yugoslav Army (JNA) on 17 September 1991, its employees had to rescue the whole Archives of charts as well as all the equipment and instruments. The Institute building was attacked and badly damaged.

By the decision of the Croatian Government of 25 October 1991, the Hydrographic Institute was designated as the institution responsible for the hydrographic activity in the Republic of Croatia. Once again the Institute was at the beginning, fortunately having preserved its archives, but left without any of its survey vessels. Therefore, in 1993 s/v "Hidra" was built with the support of the state to serve the needs of the Institute, and s/v "Palagruža" was acquired in 2003. Today's Hydrographic Institute, besides the above mentioned vessels, includes the following departments

with about 80 employees: Nautical Department, Hydrographic Department, Cartographic Department, Oceanographic Department, Reproduction Department, Information System Department, Legal and Accounting Department, and Technical Maintenance.



Figure 1: Historical review of the locations of Hydrographic Institute

Nowadays, the HHI produces different charts covering the area of the Adriatic Sea, according to the recommendations of the *International Hydrographic Organisation (IHO)* and the *International Maritime Organisation (IMO)*. As to navigational purposes, they are classified as follows:

- *Overview charts*, at 1: 2 250 000 and 1: 800 000 scales (the smallest scale of all charts produced by the HHI), showing the Mediterranean Sea, especially the Adriatic Sea,
- *General charts*, at 1: 300 000 scale, showing particular parts of the Adriatic Sea, featuring the eastern and western coast of the Adriatic on each chart,
- *Coastal charts*, at 1: 250 000, 1: 200 000 and 1: 100 000 scales showing in detail the coast and navigational areas in the Adriatic Sea,
- *Approach charts*, at a scale larger than 1: 100 000, but smaller than 1: 22 000, showing in detail particular parts of the coast, channels, passages, and bays in the most important navigational areas of Eastern Adriatic,
- *Plans (harbour and berthing charts)*, at 1: 22 000 scale and larger scale (up to 1: 1 500), showing in detail harbours, berths, and narrow channels and passages in the Eastern Adriatic Sea.

Today, when new technologies are available for access and presentation of cartographic data, cartographic work in the field of nautical cartography involves a very demanding, complex and dynamic process.

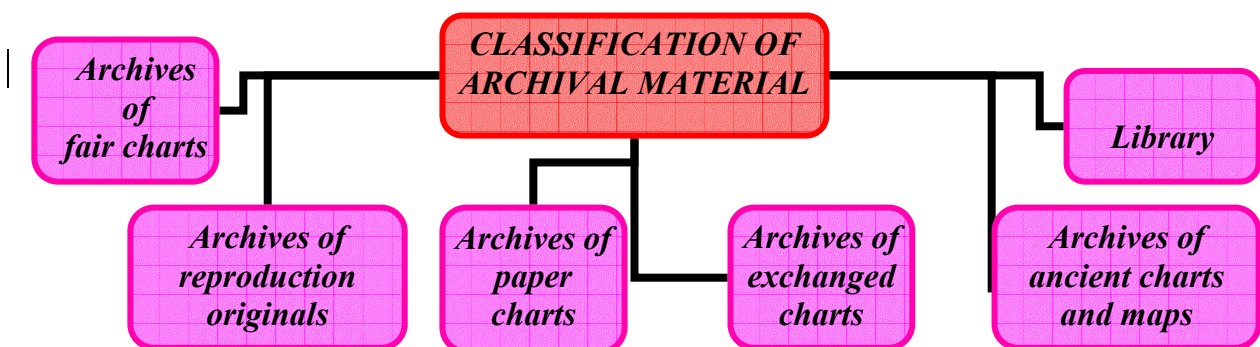
The production of the HHI includes 87 official paper charts and 90 ENC cells, regularly updated, covering the safety at sea for all navigational purposes (overview, general, coastal, approach, harbour and berthing charts).

Official paper charts are distributed to their end users through authorised distribution agents, while ENCs are distributed through Primar distribution centre (Norway).

All current developments as well as those planned for the next few years, will result in the significant improvement of cartographic representations both in paper (analogue) and ENC (digital) format from a unique database, aiming to improve the safety of navigation.

### Archival material

Archival material is arranged in the following sections:



*Archives of fair charts include:*

- sounding sheets from 1906 to 1910 (the Austro-Hungarian period), being the earliest hydrographic survey data kept at the HHI,
- sounding sheets from 1931 to 1939 (the Kingdom of Yugoslavia period),
- data from the new hydrographic survey in the independent Republic of Croatia since 1991,
- harbour charts and fair charts from 1945 to 1990 (the Socialist Federal Republic of Yugoslavia period).

Sounding sheets and fair charts from the 20<sup>th</sup> century were made using different materials: from paper with or without cloth backing to special sheets pasted on metal plates. They are kept in metal drawer cabinets, each in its own plastic jacket.

Owing to technological progress, in the last some twenty years all fair charts have been produced in a digital format, being stored in different media.



Figure 2: Sounding sheet at 1:12 500 scale, 1907(Austro-Hungarian Hydrographic Office in Pula).  
Copy is kept in the HHI Archives of original charts.

#### *Archives of reproduction originals*

The Archives of reproduction originals hold systematically stored publishing reproduction originals of all charts issued by the HHI since 1945 (the Archives also keeps older, unsystematically preserved originals, the oldest one from 1910).

Originals were produced using different materials: paper, tracing paper, engraving sheets, mostly transparent films, and they were stored each in its cardboard jacket. Previously, they were kept, thus protected, in metal padlock cases in vertical position, while today they are filed in metal drawer cabinets.



Figure 3: Reproduction original of chart No.6358 (Šibenik area) 1:150 000 scale, from 1910.  
Original is kept in the HHI Archives of reproduction originals.

*Archives of paper charts*

The Archives of paper charts hold all charts printed by the HHI.

Immediately after printing, 3 to 5 copies of each chart, either a reprint or a new edition, were stored in specially assigned metal cabinets. In this way, the history of each chart can be traced from its first printing to the present day.



Figure 4: Chart No. 207, 1:80 000 scale, new edition 1977 (HI-edition). Original and the first edition from 1936 are kept in the HHI Archives of paper charts.

*Archives of exchanged charts hold the following:*

- charts of the Eastern Adriatic Sea at different scales, of different publishers,
- charts of seas, coasts and ports of domicile states,
- other various charts received from related institutions worldwide on exchange basis (United Kingdom, Italy, France, Greece, USA, Spain, Japan, Germany, etc.), within international cooperation, according to the recommendations of the IHO.



Figure 5: Chart / Western Mediterranean, 1:151 000 scale, 3<sup>rd</sup> edition from 1957, based on the survey from 1839 to 1844 (Hydrographic Office Paris – France). A copy is kept in the HHI Archives of exchanged charts.



*Archives of ancient charts and maps*

The Archives of ancient charts and maps hold charts, topographic maps, special charts (military, meteorological, bathymetric charts, etc.), and other charts at different scales. All these charts were collected during troubled times in these areas, which affected the Institute itself. Among the above mentioned chart reproductions and originals, the following charts are worth mentioning:

- reproduction of Barents' chart of the Adriatic from the 17<sup>th</sup> century,



Figure 6: Chart of the Adriatic, 1637/1662 (Barents). Original is kept in the cartographic collection of the University Library in Split.

- the above mentioned Beautemps-Beaupré's reproduction of Plan of Split from 1806,

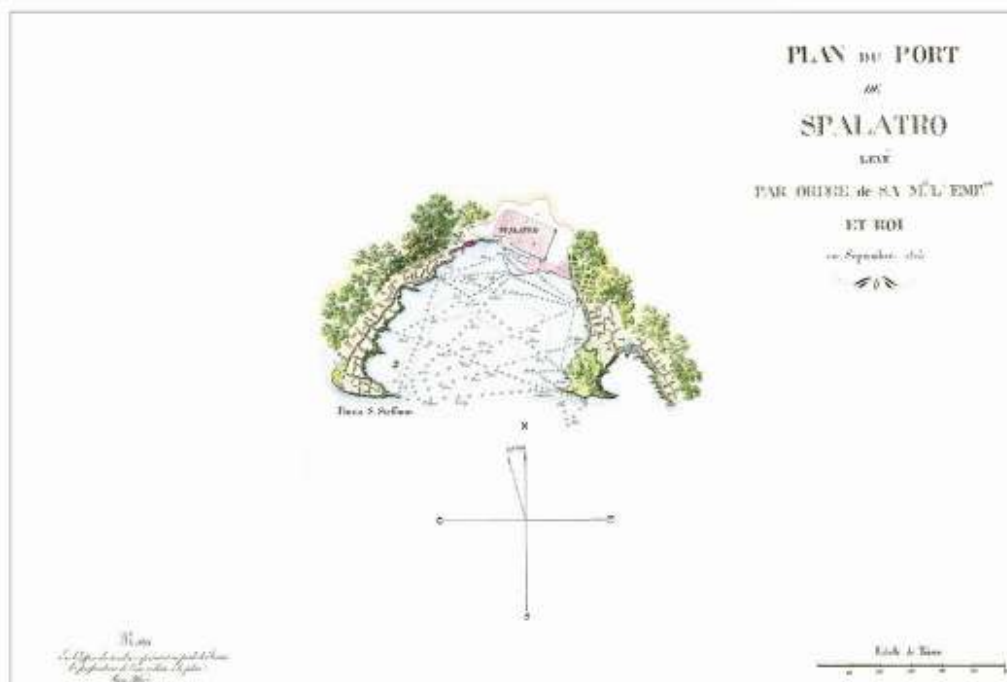


Figure 7 - Plan of the port of Split, 1806 (Beautemps-Beaupré). Original is kept in the cartographic collection of the National and University Library in Zagreb.



- numerous Austro-Hungarian charts,

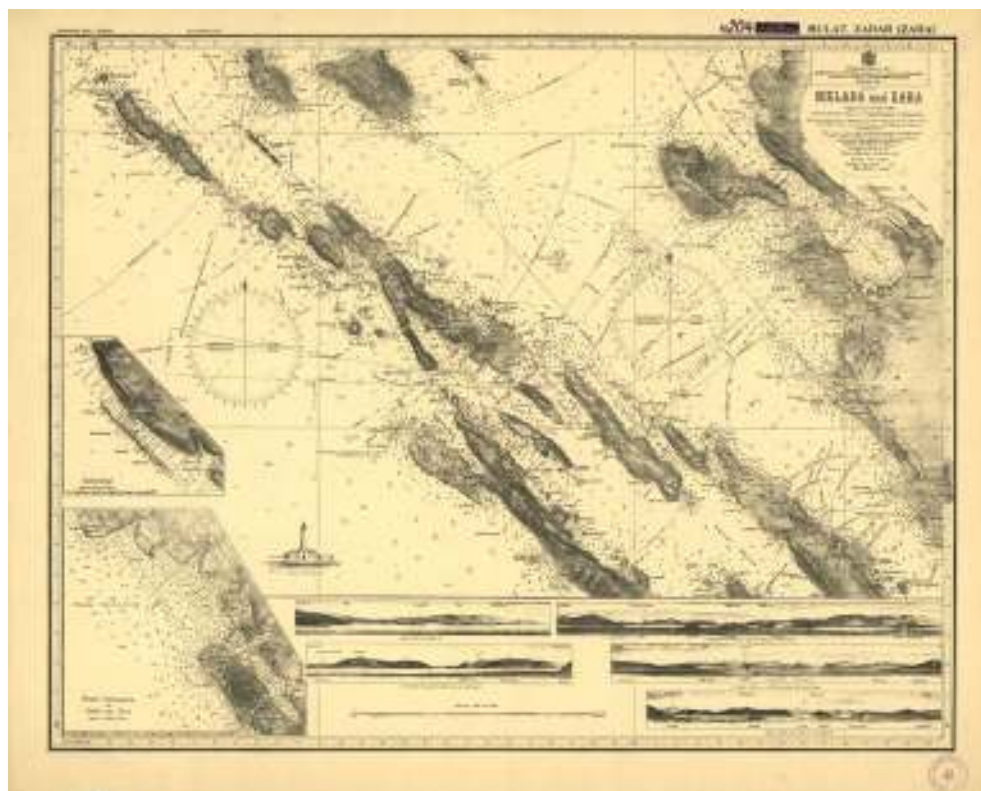


Figure 8: Chart No. 204 (Molat island and Zadar) from 1867 (Austria-Hungary), revised edition from 1927 (Kingdom of Yugoslavia). Original is kept in the HHI Archives of ancient charts.

- charts of the Kingdom of Yugoslavia, charts of the Italian, German, and partisan armies from the Second World War, etc.



Figure 9 - Chart of the Vis island from 1944 (partisan navy). Original is kept in the HHI Archives of ancient charts and maps.

These Archives are situated in special spaces with restricted access in special environmental conditions: dark moisture-proof spaces fitted with independent fire protection systems, and special metal cabinets.

### *Library*

The HHI Library holds special archival material intended for daily use in the regular work of the Institute. It is situated in a space of about 70 square metres, and its holdings are arranged by subject (geodesy, cartography, physics, mathematics, chemistry, geology, geography, navigation), being adapted to the needs of its users. Besides new titles, the library collections include master and doctoral theses, ancient atlases,

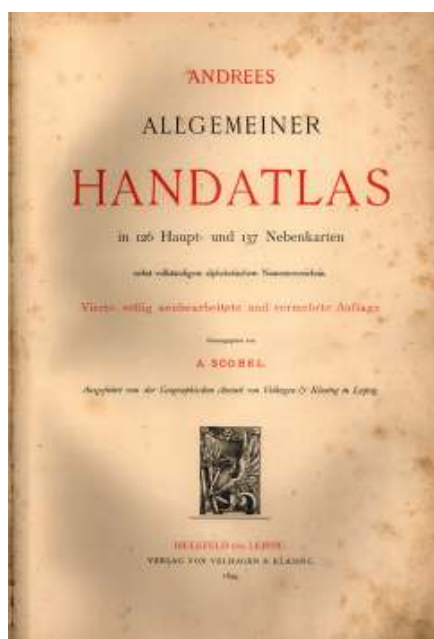


Figure 10: Andrees Allgemeiner Handatlas (General Atlas), fourth edition, 1899. Original is kept in the cartographic collection of the HHI Library.

publications, almanacs, and professional papers such as original manuscripts on the research of the Adriatic Sea from 1911-1914.

The Library keeps complete collections of Institute's own editions: *Oglas za pomorce* (*Notices to Mariners*) since 1924, *Nautički godišnjak* (*Nautical Almanac*) since 1934, and *Popis svjetala Jadranskog mora* (*List of Lights of the Adriatic Sea*) since 1938.

Over 8000 valuable titles make this Library an irreplaceable part of the past, and a source of knowledge for the present and the future of the Institute.

### **Establishing of the HHI museum**

Taking into consideration everything mentioned above, the idea of establishing a museum within the HHI, which has been topical for several years now, seems to be logical, as such institutions in the world also have something similar. The Museum is supposed to fulfil multiple purposes:

- preserving a part of the maritime tradition of Croatia – hydrographic activity, and especially the heritage of maritime cartography as its representative part,

- saving old technologies and instruments from oblivion and decay, gathering them together in one place,
- presenting the historical development and the present of the Institute to the public.

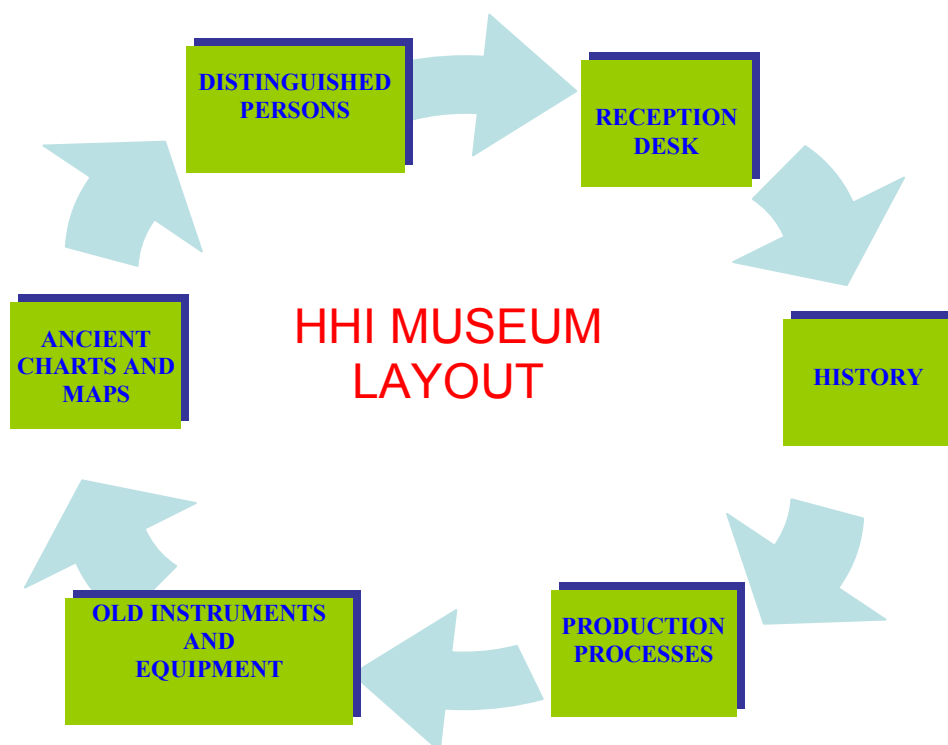
When organising the layout of the museum, HHI closely cooperated with the Technical Museum in Zagreb, and a few similar institutions in Croatia and abroad. The Future museum will be situated in the HHI building occupying over 1000 square metres, in four interconnected spaces, which have already been arranged and prepared for the display of exhibits. The layout of the museum has been conceived so as to include the following segments:

- Institute's history with photographs, written records, original documents, orders of different armies and states from the period of Napoleon to date,
- presentation of the chart production process: from data collecting to printing,
- old instruments used by all HHI departments, especially featuring cartographic department and their equipment for chart production,



Figure 11: Old equipment for chart production: engraving pins, engraving foil, „šaber“, stripping... Part of exhibits in the cartographic section of the museum.

- special space exhibiting ancient charts and maps from medieval period to the present day,
- distinguished persons in the historical development of the hydrographic activity and of the Institute,
- reception desk with souvenir shop exhibiting the reproductions of ancient charts, maps, atlases, globes, calendars with historical maps, pendants, etc. dealing with maritime cartography and hydrography.



In the last three years, most of the work on the museum project has been completed. The opening is scheduled for 2012-2013, which is a reasonable term. In the next period, one employee will be appointed as curator. It seems logical that such task should be entrusted to an experienced employee, familiar with that subject matter, probably from the Cartographic Department, being best acquainted with the above mentioned work process.

One of the major tasks of the future museum is to cooperate with schools and faculties, organising the visits of students. Being situated within the Institute premises, it will provide first-hand resources for future generations to get acquainted with maritime tradition of their city and their country, and get informed about modern work processes of the present-day Institute.

### Conclusion

The HHI Museum is established in an effort to recollect the entire history of the hydrographic activity in the Eastern Adriatic Sea, however laying emphasis on its “most popular” part – the navigational chart. It is therefore considered to be a great contribution towards preserving the development of a specific branch of the cartographic heritage – nautical cartography – throughout history.

The Museum opening, scheduled in two year’s time, will also have a symbolic meaning. Hopefully, that will be the time of Croatia’s accession to EU, and the Museum will be the place to embrace the common history of the European peoples living in these parts. Such evidence of the common past will also be a pledge of their common future.

Like other museums, the HHI Museum will help toward getting acquainted with tradition, and having respect for that tradition, to gain knowledge about the past achievements guiding the future development of the hydrographic activity.

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