

Fellows Secondment Report

The aims of the ForSEADiscovery project are to create a new generation of PhD fellows, qualified to develop their scholarly work from groundbreaking perspectives and by means of a comparative approach, but also equipped to respond to new social, political and cultural challenges. This can be achieved by insisting on a comparative element within the individual research topics; by developing ideas within a collaborative as well as comparative scheme and emphasizing communication, integrating work with Private Sector partners. Training is essential and the ForSEADiscovery Consortium assures the best possible academic supervision and scholarly training in both the fellows' host institution and through the network of scholars provided. The network training program is articulated through a programme of training workshops and Secondment.

Secondment made by the ForSEADiscovery fellows (2014-2018).

Early Stage Researchers (ESR)

ESR1. Ana RitaTrindade (Consejo Superior de Investigaciones Científicas (CSIC)

A) **Leiden University**, The Netherlands (Dates: 1/9/2015 – 18/9/2015). Supervisor: Prof. Cátia Antunes

Tasks:

- bibliography research on Environmental History and Trading Networks;
- writing of paper "Shipbuilding in Times of War. Contracts for the Construction of Ships and Provision of Supplies in the Spanish Empire in the early 17th century" with José Luís Gash and Koldo Trapaga.

B) **University of Wales Trinity Saint David**, Lampeter, Wales (Dates: 20/4/2016-15/6/2016)
Supervisor: Prof. Nigel Nayling

Tasks:

- participation in the Heritage & Environment Research Cluster Seminar Series, Building Boats and Bridges with presentation of the paper: "The use of tropical timber in shipbuilding in Cadiz (1717-1759)";
- participation in the seminar Dendroarchaeology of Ships: Prospect and Practice (Intensive Training Course ITN project ForSEADiscovery) with presentation of the paper: "Timber supply for shipbuilding in Cadiz (1717-1759)";
- GIS training: Learning ArcGIS Desktop (for ArcGIS 10.0). Basic notions of use of ArcGIS Desktop;
- archival research in Pepys Library, Magdalene College (Cambridge) and study of documents related with timber supply for shipbuilding by the British Navy in the 17th century;

- processing of data related with the case study of the Santa Maria Magdalena Frigate in preparation for the forthcoming IKUWA6 Conference, organized by the Australian Institute for Maritime Archaeology, Fremantle, Australia (25th November - 2nd December 2016).

ESR2. Maria Bastião (Universiteit Leiden)

- A) **RijkUniversiteit Groningen** (Dates: 10/04/2015- 10/06/2015) Supervisor: Prof. Jan Willem Veluwenkamp

Tasks:

- Archive Research
- Sound Toll Register online /Data base:
 1. c. 2000 entries of ships transporting wood and shipbuilding materials from the Baltic into Iberia between 1580 and 1770s. This data has been set in an excel format and will be added to the database of the ForSeaDiscovery project held in the CSIS in Madrid. These registries allow for:
 - a. identification of trading routes
 - b. listing of businessmen behind the wood trade
 - c. amounts, typologies and conditions of imported wood
 - d. price for product and shipping costs

ESR3. Manish Kumar (RijkUniversiteit Groningen)

- A) **Universidade Nova de Lisboa** (Dates: 01/06/2016-30/07/2016) Supervisor: Prof. Rosa Varela Gomes

Tasks:

- Archive Research: estimating the volume of timber imports into Portugal from the Baltic from 1669 to 1815. The basic source used so far is the Sound Toll Registers Online (STRO). STRO contains data related to the direct exports originating from the Baltic ports. In order to gain information related to imports of timber into Portugal from other European ports, the following archive resources were examined:
 - Arquivo Nacional da Torre do Tombo,
 - Arquivo Historico do Ministerio das Obras Publicos
 - Instituto Nacional de Estatistica in Lisbon.
- This collection of material relates to Portuguese foreign trade from 1775 to 1815. It contains quantitative data related to the inflow and outflow of goods from Portugal. It is important in order to gauge the importance of Baltic timber in the overall timber imports into Portugal.

ESR4. Germán Jiménez Montes (RijkUniversiteit Groningen)

- A) **Consejo Superior de Investigaciones Científicas (CSIC)** (Dates: 01/09/2015- 30/11/2015)
Supervisor: Prof. Ana Crespo Solana

Tasks:

- Archive Research: During this secondment, I was able to gain access to Spanish primary sources and the great bibliographic catalogue from CSIC-CCHS library. I undertook two one-week stays in Archivo General de Simancas (Simancas, Valladolid), in which I studied the footprints that timber merchants left in the Spanish administration during the sixteenth century.
- Methodology: I learned the basics on two methodological tools that I will use: Social Network Analys (SNA) and Geographic Information System (GIS), especially during the ForSEAdiscovery workshop “Geographic Information Systems and Social Network Analysis” (October 13-17).
- Writing papers and presentation: My research was presented in a congress at Seville, “ANDATLAN, Andalucía en el mundo atlántico moderno: agentes y escenarios”, (October 26-28).

Finally, I had several meetings with the supervisor of the secondment, Ana Crespo Solana, to discuss about my investigation. I shared an office with colleagues from the History work-package, with whom I discussed the methodological objectives of the history work-package, as well as with colleagues from the other two work-packages, with whom I learned the basics of their disciplines and discussed how each investigation could enrich the other.

- B) **University of Wales, Trinity Saint David (UWTSD)** (Dates: May 23-June 10) Supervisor: Prof. Nigel Nayling.

Tasks:

- Methodology: The main objective of this secondment was to learn how to use GIS tools. During these weeks I attended the web course “Learning ArcGIS Desktop”, which consisted in 24 hours of training.
- Discussion meetings: Furthermore, I met several times with Professor Nigel Nayling as well as with the other PhD colleagues working at UWTSD, Beñat Eguiluz Miranda and Adolfo Miguel Martins, and ESR1 fellow on secondment Ana Rita Trindade, to discuss my research.
- Paper presentation: During my stay at UWTSD I presented my research at the “Postgraduate Research Group Seminar” (June 6th) and attended to the ForSEAdiscovery workshop “Dendroarchaeology of Ships – Practice and Prospect” (May 23rd-27th), in which I learned the basics of dendro-archaeological methodology.

ESR5. Beñat Eguiluz Miranda (University Wales Trinity Saint David (UWTSD))

- A) **Archaeonauta SL.** (Dates: 13/09/14 – 18/09/14) Supervisor: Miguel San Claudio.

Tasks: Nautical scientific diving skills assessment, fieldwork and training in Underwater Archaeology.

- B) **Maritime Archaeology Trust Ltd.** (Dates 23/03/15 -10/04/15). Professional scientific diving qualifications in First Aid at Work, Recompression Chamber Awareness, and HSE Scuba. First

annual HSE diving medical. Qualifications provide all the legal requirements for working as professional scientific diver in UK – widely recognized within and beyond Europe.

C) **Archaeonauta S.L** (Dates: 03/06/2015-30/06/2015) Supervisor: Miguel San Claudio
Tasks: Training in Underwater Archaeology and nautical fieldwork. Archaeological diving and recovery of wood samples from French corvette Bayonnaise, Spanish frigate La Magdalena and the shipwreck of Ribadeo.

D) **Consejo Superior de Investigaciones Científicas (CSIC)** (Dates: 01/09/2015- 16/11/2015)
Supervisor: Prof. Ana Crespo Solana

Tasks:

- Archive Research, document collection: Research in archive, Archivo del Museo Naval de Madrid November 2-7 2015. Research in archive, Archivo General de Simancas, November 9-13, 2015. Collection of up to 150 documents related to Iberian shipbuilding
- Writing papers, preparation of draft (Thesaurus and Literature review):
 - o Assistance in preparation for the conference ISBSA in Gdansk, Poland, 2015, September 20-26.
 - o Presentation of poster in ISBSA, Gdansk, September 20-26, 2015: Atlantic Shipbuilding and the Iberian Bizcayan transition, 1550-1633.
 - o Preparation of the Thesaurus of shipbuilding construction with Antonio Rocha Santos.
 - o Writing of the 2nd draft of the Literature review.
- Data gathering for spreadsheets: Excel documents table for all collected data in the archives such as Iberian Bizcayan Ship measurements. Tables organising Iberian ships and dimensions through time and space.

E) **Maritime Archaeology Ltd.** (Dates: 13-19/04/16, 26-30/04/16, 11-14/05/16) Supervisor: Garry Momber

Tasks: Training in Underwater Archaeology, Nautical fieldwork. Recovery of wood samples from the Yarmouth Roads protected wreck.

ESR6. Adolfo Miguel Martins (University Wales Trinity Saint David (UWTSD))

A) **Archaeonauta SL.** (Dates: 13/09/14 – 18/09/14) Supervisor: Miguel San Claudio.
Tasks: Nautical scientific diving skills assessment, fieldwork and training in Underwater Archaeology.

B) **Maritime Archaeology Trust Ltd.** (Dates 23/03/15 -10/04/15). Professional scientific diving qualifications in First Aid at Work, Recompression Chamber Awareness, and HSE Scuba. First annual HSE diving medical. Qualifications provide all the legal requirements for working as professional scientific diver in UK – widely recognized within and beyond Europe.

C) **Archaeonauta S.L.** (Dates: 04/06/2015-30/06/2015) Supervisor: Miguel San Claudio

Tasks: Training in Underwater Archaeology and Fieldwork.

- The secondment consisted of gaining experience in underwater archaeology within UK HSE archaeology ACOP. The secondment was performed with the Archaeonauta, S.L. and project manager was the archaeologist Miguel San Claudio.
- The objectives included diving on three archaeological sites: The French corvette Bayonnaise, Spanish Frigate La Magdalena and the shipwreck of Ribadeo.

- During three weeks the tasks involved collecting data and samples from the selected shipwrecks to provide to other ForSEADiscovery project fellows, in particular, to the working package n. 3 (wood science).

D) **Maritime Archaeology Ltd.** (Dates: 13-19/04/16, 26-30/04/16, 11-14/05/16) Supervisor: Garry Momber

Tasks: Training in Underwater Archaeology, Nautical fieldwork. Recovery of wood samples from the Yarmouth Roads protected wreck.

E) **Maritime Archaeology Trust** (Dates: 13-19 July 2016) Supervisor: Garry Momber

Tasks:

Aims:

- To gain experience within commercial maritime archaeology environment.
- Improve skills in 3D underwater environment recording.
- Develop skills as a workshop organization team member.

Objectives:

- To achieve a better understanding of the particularities within the commercial archaeology targets and planning.
- To developing planned tasks within particularly short time framework.
- To develop or adjust suitable methodologies within a short time timeframe.
- To achieve higher standards in terms of deliverable documents such as reports and protocols.

Methodology:

- The secondment consisted of diving operations on the archaeological site of Bouldnor Cliff and classroom workshops at the National Oceanography Centre (Southampton, UK).
- The conditions in the Solent River are particularly aggressive in terms of underwater environment. Strong currents and fast changes of water flow aggravated by the tides give only short windows to undertake archaeological survey and excavation.
- Within these complex conditions three diving days (two dives per day) within HSE archaeology ACOP were completed in order to collect significant data to reconstruct the submerged Mesolithic landscape.
- The tasks to be developed within the schedule timeframe include:
 - Digital photographic recording of section at Bouldnor Cliff V used cameras with waterproof cages and lights, and post-processing to produce a photomosaic and photogrammetric 3D reconstruction. Supervised students from the University of Alexandria in the use of these technical methods.
 - Second stage of the Secondment was held in the National Oceanography Centre. The tasks involved the usage of the data collected in the Solent River at the Bouldnor Cliff (BCV) archaeological site. Lectures given about Adobe software (Photoshop, Lightroom) and Agisoft photoscan.
 - Drone survey and digital recording of shipwrecks located in intertidal zone was also considered during the secondment.

Conclusions:

- The secondment at the Maritime Archaeology Trust proved to be highly relevant. I took part as part of the team from the Trust experiencing day-by-day tasks such as planning, executing and reporting the planned tasks.

1. Experiencing the adopted methods and developing techniques within higher standards and demands has encouraged me to reflect on my way of thinking. Developing more in less time and still keeping a high level of safety and professional standards is to be considered in future.
2. Working with researchers from other academic institutions with different experience and background proved to be highly important in terms of gaining personal experience. I considered that multi-cultural teams are also recommended for exchange of knowledge and research questions.

ESR7 Antonio Rochas (Universidade Nova de Lisboa)

A) **Archaeonauta SL.** (Dates: 13/09/14 – 18/09/14) Supervisor: Miguel San Claudio

Tasks:

Nautical scientific diving skills assessment, fieldwork and training in Underwater Archaeology.

B) **Maritime Archaeology Trust Ltd.** (Dates 23/03/15 -10/04/15). Professional scientific diving qualifications in First Aid at Work, Recompression Chamber Awareness, and HSE Scuba. First annual HSE diving medical. Qualifications provide all the legal requirements for working as professional scientific diver in UK – widely recognized within and beyond Europe.

C) **University Wales Trinity Saint David (UWTSD)** (Dates: November 2015) Supervisor: Prof. Nigel Nayling

Tasks:

- Writing papers. Report about Thesaurus and Glossary on Iberian Shipbuilding together with ESR5 fellow Beñat Eguiluz Miranda.

D) **University Wales Trinity Saint David (UWTSD)** (Dates: 01/04/2016- 31/05/2016) Supervisor: Prof. Nigel Nayling

Tasks:

- GIS training courses.
- Beginning of Rhino training.
- One presentation about the PhD on the academic meetings.
- Discussions meetings: Some reviews on thesis research questions; Some reviews on the work conducted so far in Cais do Sodr ; One presentation about Cais do Sodr  on the academic meetings.
- Presentation on the Network Meeting.

E) **Maritime Archaeology Ltd.** (Dates: 13-19/04/16, 26-30/04/16, 11-14/05/16) Supervisor: Garry Momber

Tasks: Training in Underwater Archaeology, Nautical fieldwork. Recovery of wood samples from the Yarmouth Roads protected wreck.

ESR8. Koldo Trápaga Monchet (Universidade Nova de Lisboa)

A) **Archaeonauta S. L.** (Dates: 12 – 18/ 06/2015) Supervisor: Miguel San Claudio

Tasks:

- Underwater Archaeology and Training in diving skills. This one-week secondment was within the nautical archaeological campaign the Project conducted in Galicia (Spain) in June 2015. During this campaign I got involved in the nautical campaign conducted in Finisterre and Viveiro where I provided technical support to the diving team. In addition, I received training in diving and techniques required in nautical archaeology.

B) **University Wales Trinity Saint David (UWTSD) (Dates: 01/04/2016- 31/05/2016)**
Supervisor: Prof. Nigel Nayling

Tasks:

- To develop skills in the software called ArcGIS which allow us to create historical maps deploying the data collected through Archives, Libraries and the bibliography.
- Courses of ArcGIS (“Basics of Map Projections” and “Learning ArcGIS Desktop”) in order to have enough skills to create historical maps by myself. At the end of the secondment we did not only create some maps, but I received enough training to deploy ArcGIS by myself.
- Weekly workshop where the PhD students, professors and young students shared our perspectives and discover other frameworks. In these workshops I presented three different papers of individual research.
- Individual meetings and seminars on writing papers and presentations skills.
- Historical Research in the British Library (Manuscripts Collection stores significant primary sources regarding the governance of the Spanish and Portuguese Empires throughout Early Modern age)
- Discussions with other ForSEAdiscovery workmates (Marta Domínguez Delmas, Beñat Egiluz, Nathan Gallagher, Peter Groenendijk, Germán Jiménez, Adolfo Martins, António Rocha Santos, Ana Rita Trindade,) which enabled us to discuss our research and to learn from one another. From my viewpoint, it was undoubtedly one of the most enriching and rewarding features of the secondment.

C) Centro Superior de Investigaciones Científicas (Madrid, Spain) from 15th February to March 30th 2017 supervised by Ana Crespo Solana. During the secondment he has:

- Developed his skills in QGIS with the collaboration of M^a José García Rodríguez (member of the CSIC team of ForSEAdiscovery) with the main purpose of creating create historical cartography of the Portuguese forested areas throughout 15th, 16th and 17th century as a part of his personal project entitled “Forestry, timber supply and maritime struggle in Portugal (1560-1640)”
- Arranged all the archival historical data regarding the flow of timber supply for shipbuilding in Portugal detailing the tree species, the areas supplying timber, the agents involved and ship components constructed with each tree specie.

- Used the CSIC library to work on some joint and individual articles and book chapters, related to the Spanish and Portuguese Monarchies and the European maritime powers in the fields of Environmental, maritime and political history.
- He had developed his research skills working with primary sources at the Segovia Cathedral archive with Ana Crespo Solana and Marta Domínguez-Delmás, in order to use the results in an article about the history of the building combining dendrochronology and historical research.
- Has worked together with María José García Rodríguez to write the book chapter “Los aprovechamientos forestales de los bosques portugueses desde una perspectiva Cartográfica durante la Unión Ibérica (1580-1640)”, that they are presenting in Málaga (Spain) at the Conference organized by the Spanish Society of Digital Humanities.
- Has attended to seminars and workshops at CSIC, King University Juan Carlos and the Marie-Curie Alumni General Assembly.

ESR9. Marta Domínguez- Delmás (Universidad de Santiago de Compostela)

A) Wageningen University (Dates: 2-Feb/4-May 2015) Supervisor at host institute: Dr. Ute Sass-Klaassen

Tasks and activities carried out during secondment:

- Analysis of pine samples from Andalusia and testing blue intensity method to measure latewood density in *Pinus nigra* in collaboration with Linar Akhmetzyanov (ERS10)
- Sampling of Delta I and Delta II shipwrecks and analyses of samples in collaboration with Linar Akhmetzyanov
- Co-applicant together with Ute Sass-Klaassen, Paul Copini and Linar Akhmetzyanov in Trees4future proposal for the DNA analysis retrieved from historical timbers
- Collaboration as teaching assistant in the practical course ‘FEM1030600 – Ecology of Forests; 1st year BSc course in Forest and Nature Conservation’ from the FEM department
- Analysis of results and preparation of article about research of roof timbers from Segovia cathedral
- Collaboration and participation in dissemination event ‘Wood in the SPOTlight’ organized by Ute Sass-Klaassen; presentation about dendroarchaeological research on shipwrecks targeting a mixed non-specialised audience: ‘How Spanish were the ships from the Spanish Armada?’
- Presentation of individual project at Wageningen University: ‘Forest history and shipbuilding: developing a tree-ring network for provenancing oak and pine ship timber from Atlantic Iberia’
- Involvement in all activities organised by the department (attendance to invited lectures, presentations from other research fellows, etc.).

B) University of Wales Trinity Saint David (UWTSD), (Dates: 2-28 May 2016), Supervisor at host institute: Prof. Nigel Nayling

Tasks and activities carried out during secondment:

- ArcGIS course
- Analysis of samples from Yarmouth Roads shipwreck
- Assisting Nigel Nayling and Roderick Bale during sampling of historic building
- Participation in design and implementation of ‘One Tree Project’ in collaboration with Peter Groenendijk (ER3), Nigel Nayling and Roderick Bale
- Seminar: ‘Dendroarchaeology and dendroprovenance in the study of shipwrecks’

- Intensive Training Course (C3) ITN project ForSEAdiscovery (23-27 May): Dendroarchaeology of Ships: Prospect and Practice
 - Lecture at Intensive Training Course (C3): 'Dendrochronology and shipwrecks in Iberia'
 - Presentation of preliminary results of ongoing individual project at ForSEAdiscovery Project Conference UWTSD: 'Developing reference tree-ring data sets for dating and provenancing Iberian shipwrecks'
- C) **University of Lorrain (Nancy, France):** 16-27 January 2017: two-week secondment under the supervision of Anne Poszwa to learn about geochemistry (isotopic research -strontium- and analysis of element composition in the wood).
- D) **CSIC, Madrid, Spain:** 24/04 - 24/06/2017: two-month secondment under the supervision of Ana Crespo Solana to train in historical research and GIS applied to field and historical data.
- E) **University of Santiago de Compostela:** 13 and 17 July 2017: visiting Mohamed Traoré in Santiago de Compostela to analyse biomarkers in the wood (pyrolysis, FT-IR) of samples from Segovia cathedral.

ESR10. Linar Akhmetzyanov (Universiteit Wageningen)

- A) **Universidad de Santiago de Compostela** (Dates: 03.06.2016- 29.07.2016) Supervisor: Prof. Ignacio García González, Prof. Antonio Martínez Cortizas
- During the Secondment following activities have been done:
- additional field campaign in the Central System of Spain with the WP3 members. During the sampling, we collected in total 124 cores of *Pinus sylvestris*. Samples were dried in the lab and now stored in the lab to proceed with analyses;
 - learned two new programs developed by Prof. Dr. Ignacio García González for anatomical measurements of *Quercus* spp.;
 - prepared and measured anatomical features of 27 oak trees (54 cores) from three sites and have prepared 10 trees (20 cores) from fourth site for further analyses (ca. 3000 vessels per core). Measurements were done using programs learned under supervision of Prof. Dr. Ignacio García González. As a result were created three new 500 years old vessels chronologies;
 - have adapted three vessels chronologies (containing 8 trees each) created before to the new format;
 - have done primary analyses on created data.

- B) University of Santiago de Compostela, campus Lugo: Secondment Date: from 03 June 2016 to 29 July 2016

Objective: Improving skills in wood-anatomical analyses of ring-porous tree species (*Quercus* spp.)

- c) Université de Lorraine, Nancy, France: Date: from 16 January 2017 to 27 January 2017

Objective: Acquisition of knowledge and methodology on geochemical fingerprinting of potential source areas of wood from shipwrecks

ESR11. Mohamed Traoré (Universidad de Santiago de Compostela)

A) **Université de Lorraine** (Dates: June 06th 2016 to June 17th 2016) Supervisor: Prof. Anne Poszwa

Tasks:

- This secondment was in the framework of ForSEAdiscovery project, referring to the annex 1 of the project. The principal interest of this secondment remains to improve the relationship between fellow of the WP3 according to the interdisciplinary approach in this multidisciplinary project. This research stay carried out within the research group “Laboratoire Interdisciplinaire des Environnements Continentaux (LIEC)” at Université de Lorraine, the principal aim was to learn about techniques aimed at isotopic fingerprint of wood and soils for provenance identification.
- During this secondment we worked with three (03) shipwreck samples from Ribadeo, la Bayonaise and la Magdalena samples; sampled in June 2015 by other fellows of the project. The samples were dried and milled in very thin powder to help the extraction process. The sensitivity of the equipment used to measure the isotope requires working in a clean area; in our case we were working in a referenced clean room.
- In order to mineralize wood strontium content, samples undergo several extraction steps in a view to eliminate other wood chemical compounds (organic and mineral). The main role of various extraction is to remove the influence of the sea water, and to keep the original signal of the timbers. In general, strontium isotope ratio are very sensitive so that it is crucial to only keep the strontium content of the wood samples. At the beginning the samples are left in ultra-pure water during one (01) in order to remove all of the possible extractable content in our samples (sea water and some phenolic compounds). The second stage of extraction with acidic solutions in order to separate the strontium moieties from the rest of mineral content in our samples. Afterward the strontium is recuperated through some specific resin columns, in order to send them for isotope analysis in a lab in Paris.

This secondment has been very important to get understanding about isotopic analysis of wood samples. Moreover we had interesting discussions, during which we exchanged ideas with a view to future collaboration about combining data of organic and mineral composition of wood.

B) **Universiteit Wageningen** (Dates: October 26th 2015 to December 18th 2015) Supervisor: Dr. Ute Sass-Klaassen

Tasks:

- This secondment was in the framework of ForSEAdiscovery project, referring to the annex 1 of the project. The principal interest of this secondment was to improve the relationship between fellows of the WP3 according to the interdisciplinary approach in this multidisciplinary project. This research stay carried out within the research group Forest Ecology Management in Wageningen University, the principal aim was to introduce ESR11 to tree ring science, through techniques based on wood anatomy. For the purpose, our tasks were to get wood samples ready for vessel size measurement, and then analyze data obtained. Furthermore organizing the Dendro workshop for the other fellows of the ForSEAdiscovery project was a part of this secondment.

- The samples used were some cross sections of *Quercus* spp., taken during the spring sampling in the Basque Country at the shipbuilding company Albaola in Pasaja. This company collected these trunks from the Sakana forest during autumn 2014.
- It must be mentioned the importance of sample preparation because the better the samples are prepared, the better will be the data. It is therefore worth spending the necessary time on sample preparation. The software (ROXAS) for vessels and tree-ring analysis required a high resolution scan of the radial surface of the cross-section which is why the first step is cutting the surface in order to get a homogeneous flat surface. For that a microtome were used with a sodium hydroxide solution to make the cutting process easier.
- ROXAS is powerful software for vessel analysis with a very nice option for automatic vessel area quantification, however, it is necessary to do a manual check to correct some missing vessel areas and also to correct the occurrence of some quantified areas that are not vessels.

During this research stay I participated in the organization of the Dendro workshop, organized for the other fellows to show them how dendrochronologists work. During that workshop, I also gave two oral presentations. The first was about dendrochronology and wood chemistry while the second was about the interdisciplinary approach considering wood organic and inorganic chemicals, wood anatomy and dendrochronology.

This secondment has been a good experience, it was important for me to get an understanding about dendrochronology and wood anatomy. It was a great opportunity to have discussion about wood anatomy and wood chemistry together with a view to future collaborations. I also got the opportunity to develop my teaching skills during the workshop.

ESR 12 Fadij Hajj (Université Lorraine)

A) **Universidad de Santiago de Compostela** (Date: 11 May 2015 to 29 May 2015) Supervisor:
Prof. Ignacio García González, Prof. Antonio Martínez Cortizas

Objective: Acquisition of knowledge and methodology on wood anatomy for provenance studies.

Tasks achieved and knowledge acquired:

- Theory on wood anatomy and dendrochronology
- Sample preparation:
 - o Gluing wood cores into special frames
 - o Cleaning wood from tylosis
 - o Microtome cutting
 - o Sanding the samples
 - o Chalking the samples
- Measurement of samples:
 - o Measuring tree-rings width using specific software and a microscope
 - o Statistical description (number of sapwood vs heartwood; number of rings with tyloses)
 - o Acquiring knowledge on the different softwares used commonly for wood anatomy
 - o Application on the prepared samples

Comments:

During this secondment I acquired the necessary knowledge about the methodology and the application of wood anatomy in provenance studies. This can help me understand the whole approach on wood anatomy in order to be able to combine my research results with other fellows at the end of

the PhD. Learning about wood anatomy helped me to widen my knowledge on the wood science and certainly helped for a better understanding of my own research project. It also enlarged my perspective in order to be able to conduct research projects in the future in a multidisciplinary way.

Secondments hosted:

- Date: from 6 June 2016 to 17 June 2016

Concerned fellows: Mohamed Traoré (ESR11)

- Date: from 14 November 2016 to 25 November 2016

Concerned fellows: Peter Groenendijk (ER3)

- Date: from 16 January 2017 to 27 January 2017

Concerned fellows: Marta Dominguez-Delmas (ESR9) and Linar Akhmetzianov (ESR10)

ESR13 Nathan Gallagher (RijkUniversiteit Groningen)

- A) **Consejo Superior de Investigaciones Científicas (CSIC)** (Dates: 29 February – 29 April, 2016). Supervisor: Prof. Ana Crespo Solana

Tasks and objectives:

The primary focus of this secondment was to collect documents pertaining to timber from the section of Tribunal Mayor de Cuentas, a record of naval department purchase receipts from the Archivo General de Simancas. Ana Rita Trindade and I focused on the Cadiz department, and were able to collect a complete series from the 1730s through the 1770s, with some gaps due to inaccessible legajos in the series of interest. While not in the archives, I focused on familiarizing myself with those photocopies of documents that were already ordered and received by Ana Rita Trindade. As such, I was able to experiment with tabulating these receipts and putting them into a small database for the years of 1770-4 in the El Ferrol naval arsenal. This was relevant to a collaborative case study that is being prepared for presentation at the IKUWA6 conference in Western Australia at the end of November and beginning of December 2016. I created a successful database of this information that was able to be successfully cross-referenced with the Sound Toll Registers. This allowed me to write my full contribution to the case study presentation.

- B) **University of Wales Trinity Saint David (UWTSD)** (Dates: 2-27 May) Supervisor: Prof. Nigel Nayling

Tasks and Objective: ArcGIS course:

This short secondment of three weeks was used to build a skill set in ArcGIS, with the intention of displaying some information from the Sound Toll Registers on GIS maps. I feel this was successful, as I was able to produce proportional maps, both static and animated, of the exports of timber from the Baltic region to Spain. These maps will be made available to the other members of the project for use in blog entries or publications with the understanding that I will be credited for creating them.

ESR14 Selina Emma Ali (Wales Trinity Saint Davis, UK)

A) **University of Santiago de Compostela, Campus Lugo Spain** 9-13 January 2017: research was undertaken with two major objectives in mind.

The first objective was to look at an expedited way to upload dendro data onto the DCCD, in the hopes of creating a workflow that bypasses the use of Tridabase, option instead for doing everything in Past 5 dendro software. The second objective was to look at the structure and content of WP3's entries into the FSD database. Both objectives were met. A new workflow was created with Marta Dominguez Delmas (ESR 9) using Past 5 to successfully upload data onto the DCCD. The second objective was met after a long meeting with Ignacio García González and Peter Groenendijk (ER1), where minor structural changes were made to the database. Most notable of these changes is the addition of a Sub Sample number for the Sub-Sub-samples that are taken by WP3. This leads to a longer string, but a clearer picture of what data is being presented. An example of the new character string is as follow T-ALB01-002S-01S-001.

Comments:/ Objectives:

There were two main objectives for the week, the first was to look at expedited way to uploaded dendro data onto the Digital Collaboratory for Cultural Dendrochronology (DCCD), in the hopes of creating a workflow that uses Past 5 dendro software to bypass the Tridabase export phase that is normally required. Experimentation was to be done with Marta Dominguez Delmas.

The second objective was to look at the structure and content of WP3's entries into the FSD access database with Peter Groenendijk.

Outcomes:

Objective 1- Traditionally, to upload dendro data into the DCCD one would need to convert the file format into something called Tridas, using a free program called Tricycle. Once this tridas xml file is created it is then uploaded in an access database called Tridabase, where the user fills in the appropriate metadata into the correct fields. From this the data is then exported into a new xml and then uploaded into the DCCD. The problem with this process is that Tridabase currently only runs on older 32 bit computers. This means transferring data to an older machine and working with it there and then moving it back to a newer machine for faster uploads, and for storage.

Several experiments were done using the Past 5 software which has a function to export tridas xml files directly from the program. The results of this found that the DCCD website reads each radius as an individual sample or element, meaning that if a sample has two radii attached to it, the program will read it as two separate samples. So we decided a compromise of a mean curve could be uploaded for every sample, and the data that is normally filled in from tridabase is filled in manually online. This compromise was acceptable because the DCCD allows the upload of text files, excel spreadsheets, and pdfs, and we decided raw data could be collated that way and uploaded as an attachment to the project.

We also decided that instead of one large ForSeaDiscovery project tab in the DCCD we should upload each wreck, forest, and building as an individual project. This allows the project to highlight to geographical distribution of its sampling by creating more dots on the GIS map that is on the DCCD website.

Objective 2- Upon inspection of the database structure of the most up to date database (09/16) it was immediately evident that the samples_buildings and the samples_trees tables were missing. So going back to an older database we resurrected the missing tables and decided to stick to the format of the

past. Using the most up to date excel spreadsheets from the administration in Lugo we were eventually able to append them into the appropriate access table. Several small import errors occurred, but with time and closer inspection all of the errors were found and fixed. To append data into the access database the data sheets need to be free of macros, and the data headings need to match exactly in both characters and case. The most up to date database now exists on a dropbox folder that is kept up to date and backed up on a cloud storage system.

In addition to this we decided to add a sub sample number for the sub-sub samples that are taken. This leads to a longer sample ID string, but lessens the administration of who owns which sub samples. Because Mohamed Traoré will create the most subsamples, he needs more than 100 but less than 1000 for each sample, meaning the string will be 3 characters long. This means a new id like T-ALB01-002S-01S-001 and so on. This means we no longer have to work with ranges of numbers and instead go with the previously establish convention and all sample numbers 03S go to Mohamed and 04S go to Fadi Hajj.

New tables however need to be created for Fadi and Mohamed, and all these tables will feed into an analysis results table which is already created in the database.

B) **Maritime Archaeology Trust (MAT)** 19th September-29th September 2017.

Objectives:

1. Discuss database standards in the heritage sector in the UK (including MEDIN, MIDAS, and ADS protocols)
2. Work on a pipeline to optimise, and at times, enhance photogrammetric data from Agisoft using Zbrush 2R7
3. Learn how to post process sidescan survey data from a commercial project—including how to enhance it in software, how to process it, and what anomalies are significant
4. Learn about different digital capture methodologies employed at MAT

Results:

Objective 1- database standards:

After discussion with Brandon Mason, we concluded that the ForSEAdiscovery project (FSD) has not created any marine environmental data types that would fall under MEDIN (marine environmental data and information network) classification. The MIDAS classification system is another system created for historic data by Historic England. It provides a data standard that sets the minimum level of information needed for recording heritage assets. Though shipwrecks are covered by the standard, the level of information needed is bare minimum and mostly covered by the earlier stages of the FSD project. The ADS (Archaeology Data Service) is the most likely place the data from WP2 of FSD will be deposited. The metadata standard is clearly laid out for traditional forms of archaeological data (i.e. videos, pictures, pdfs etc), however the photogrammetric guidance has recently been published by the ADS. It is expected that FSD will at least meet these metadata standards, which are laid out here in their self-published 'Guides to Good Practice' [http://guides.archaeologydataservice.ac.uk/g2gp/Photogram Toc](http://guides.archaeologydataservice.ac.uk/g2gp/Photogram%20Toc)

Objective 2- photogrammetric optimisation pipeline

This is an ongoing project collaboration between myself and Brandon Mason, and the process is still being refined after several discussions at the MAT offices. Currently, the most popular way to display photogrammetry to the public is using the website Sketchfab. This works well for smaller, low resolution models. However it is increasingly becoming obvious that the relatively small data limit for

what can be uploaded to the website negatively impacts what type of data we can display for the public. It means that higher resolution models that are visually more impressive, and archaeologically more accurate are never published or seen by the public due to their mesh sizes.

To combat this, we are trying to find a way using ZBrush digital sculpting software to both enhance photogrammetry—by this we mean bring back information that is present in the photos, and in some cases, the dense point cloud, and modelling them back into the mesh model. Using the functionality offered by Zremesher- it may be possible to decimate a 7-10 million faced model to a few hundred thousand faces, without losing the detail of the higher resolution model.

To enhance a mesh with more detail, first all the holes are filled on the model (rough edges trimmed, around the outer faces of the model to make it easier on the processor), the model is thickened, and then dynameshed. Additional detail can be sculpted in using the built in functionality of the program, and the final high resolution model can be duplicated and remeshed using Zremesher. Following this, details from the higher resolution model is projected onto the lower resolution model. The low res model is subdivided and projected on about 4-5 times. Following this, the UVs are set up using the UV master plug in for Zbrush, and height, displacement, and normal maps are baked out of the high res model, and re-attached to the low res model. This means the low resolution model can be given the look and impression of a high resolution model, without having the polycount of it.

Using just Zbrush is one of the potential workflows being developed. Using B2M software from Allegorithmic is also being looked at, as well as Substance Designer and Substance Painter, also from Allegorithmic, is also being tested for potential workflows for accurate texture recreations. This is an ongoing process, the best method will be chosen based on a combination of number of operator hours, the type of machine needed to process, and the best software option as far as functionality and cost. The intended end of all of this is a potential publication and/or work flow made for archaeologists to provide guidance of photogrammetry model optimisation. Again, this work is ongoing.

Objective 3- Sidescan data

One of MAT's open tenders involved the processing geophysical data, in this case, side scan sonar data, both high frequency and low frequency. The survey area is part of an ongoing windfarm project, located off the east Anglian coast of Britain. Using the software SonarWiz, I was taught how to open, map, enhance, and display all of the sidescan data. I was also shown how to incorporate GIS data into the software. Over the course of two days, I visually processed over 470 lines of sidescan data, identifying anomalies of both high and low archaeological potential.

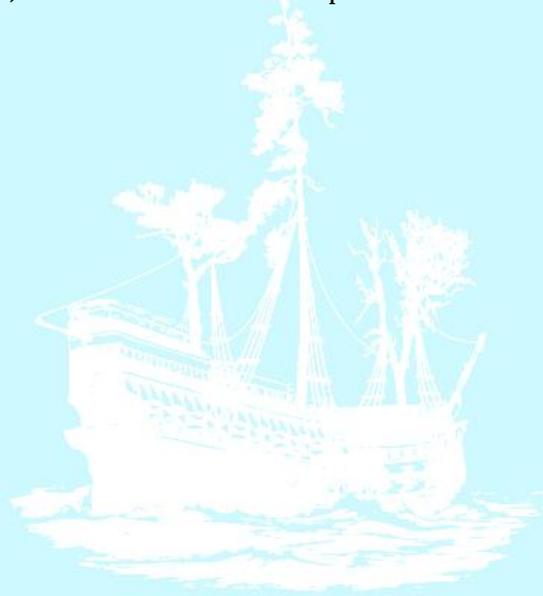
Objective 4- digital capture methods

One of the days of the secondment was spent learning and using a SLS (structured light scanner) to scan a large brass bell from the S.S. Mendi. The bell was one a temporary one week loan to MAT. The bell was scanned with an SLS scanner manufactured by David. It is a simple, relatively inexpensive set up that uses an HD camera in conjunction with a small projector. The bell was scanned in approximately 30 sections, taking less than two hours work time. Following this, using the Software David 4 and 5, the scans were stitched together to create the full 3D object. The scanner has a resolution of .05mm accuracy. Once it is calibrated, the scanner can be moved to gain different angle without any problems-i.e. it does not have to be re aligned or re calibrated after every move. Below is an image of the scanning of the bell and a screen grab of the final Mendi Bell scan.

ESR 15 Ignacio González Espinosa (Universidade Nova de Lisboa)

A) CSIC. Madrid: 02/10/2017-06/10/2017. During this week we were at the Consejo Superior de Investigaciones Científicas (CSIC) under the coordination of the profesora Ana Crespo Solana. One of the objectives are to concrete the aims of our research. We had our first approach to the GIS Systems and the possibilities that this tool provide to the historical investigation. In the case of the wrecks, how we can localize them on the maps and trace the routes of the shipping. Firstly, it was necessary to organize the data of our research to make it useful and introduce it in the system. Also we deepen in the bibliography about networks and cooperation, in order to improve our project and prepare future applications.

Visit Archivo General de Indias de Sevilla (Spain) 09/10/2017-13/10/2017. Our investigation in the Archivo General de Indias (AGI) had two principal aims. On the one hand complete the information that was incomplete in the publication consulted. In many cases, when we only have some data about the wrecks, we can fulfil it by consulting directly the historical records. On the other hand we found for unpublished wrecks in the archive. The search in the register of “Idas y venidas” was fundamental. In the register appear all the vessels that come and back to America. In the case of the ship was sunk, the record offer information about the place and dates. Other collections, related to lawsuits also provide information about wrecks, the routes and cargoes.



Experienced Researchers

ER1. Dr. José Luis Gasch Tomás (Consejo Superior de Investigaciones Científicas, CSIC)

A) **Maritime Archaeology Ltd.** (Dates: 06/04/2015-02/05/2015). Supervisor: Garry Momber
Objectives:

- Literature and research in collaboration with the University of Southampton in Southampton.
- Database accomplished, Data model:

The model is already finished and, in coordination with the other two Experienced Researchers of the project – Sara Rich (ER2) and Peter Groenendijk (ER3)–, I have started to enter data. This model and database is already serving as a basis for a GIS model for Iberian shipwrecks and timber provenance. Most data came from the DynCoopNet database, the Associated Partner Filipe Castro's database and samples collected in archeological campaigns carried out in Ribadeo (Spain), Belinho (Portugal) and Yarmouth Roads (UK). Planning and coordination work has entailed the elaboration of several questionnaires to be filled by the fellows of ForSeaDiscovery. Questionnaires collect the scientific information which fellows expected to produce and use for his/her research in ForSeaDiscovery. We have already entered data of more than 200 Iberian shipwrecks located in different areas of the world. Firstly, data are organized into several tables which holds information about the dimensions, type, architectural features and additional characteristics of shipwrecks. Secondly, the database holds information from the archaeological campaigns of ForSEADiscovery, including a dive log and a register of visuals. Thirdly, the database contains data of timber and wood samples taken from shipwrecks, living trees and historical buildings, including results of dendro-analysis. I, with Sara Rich and Peter Groenendijk, have elaborated a guide of the database –instructions with descriptions of all the tables and fields –, which might be helpful for researchers who plan to use the database. Although the database already has browsers to find information, I would recommend creating more perfect browsers in the future, which might be done with the assistance of computer programmers and/or software developers

B) **RijkUniversiteit Groningen** (Dates: 01/02/2016-31/03/2016). Supervisor: Prof. Jan Willem Veluwenkamp

Tasks and objective:

- Public lecture “Shipbuilding and Globalization. Tar trade from the Baltic to the Iberian Peninsula in the 18th century”, organized by the Department of History at the University of Groningen (The Netherlands), 21/03/2016.
- Participation in these conferences, alongside my secondments (see below), have been the main way of networking with colleagues and experts.
- Lecture on “The GIS-Oriented ForSeaDiscovery database design” (1.5 hours) in the Intensive Training Course “Historiography and Archive Research”, University of Groningen (The Netherlands), 08/05/2015.
- Guest chair to coordinate the debate “Fellows meeting and plenary discussion” (1.5 hours) in the Intensive Training Course “Historiography and Archive Research”, University of Groningen (The Netherlands), 08/05/2015.
- Writing papers.

ER2. Dr. Sara Rich (Maritime Archaeology Ltd)

A) **Archeonauta, S.L.**, (Dates: 3 June 2015 – 1 July 2015) Supervisor: Miguel San Claudio

Aims and achievements: Working with ForSEAdiscovery partner Miguel San Claudio, and with the assistance of partner Garry Momber (Maritime Archaeology Ltd.) and WP2 Coordinator Nigel Nayling, I developed the project design, archaeological plan, and dive plan for WP2's first season of underwater fieldwork. These plans and other preparatory documents were modeled on those currently in use in Great Britain and required by Historic England and the Health and Safety Executive (HSE). We worked together to establish a best-practice methodology for archaeological diving in Spain, which was also modeled on HSE standards. Our aims were to remove sufficient timber samples from selected shipwrecks off the Galician coast (the Bayonnaise (Finisterre), La Magdalena (Viveiro), and the Ribadeo (Ribadeo)) to supply WP3 with material for dendroprovenance. From these shipwrecks, we removed a total of nearly 80 wood samples. Each of these samples was recorded archaeologically according to Historic England guidelines before being handed over to WP3 for scientific analyses. The in-situ timber sampling protocols, one of my deliverables, has benefited tremendously from the experience gained during this secondment.

B) **University of Wales Trinity Saint David (UWTSD)**, (Dates: 22-27 November 2015) Supervisor: Prof. Nigel Nayling

Tasks and objectives:

- Aims and achievements: Working with WP2 coordinator Nigel Nayling, I was able to confirm changes to the WP2 tables in the project database. Furthermore, because three WP2 fellows were also there at that time, we were able to make plans for the 2016 sampling campaign at Yarmouth Roads (England, UK). These fellows have as a deliverable a multilingual/multimedia glossary of shipbuilding and ships' timbers, and I was able to provide some feedback on this and contribute to surrounding conversations, as well as receive input from the fellows and Prof. Nayling on the draft of the in-situ timber sampling protocols. Finally, I was able to start conversations with Prof. Nayling on project ideas for the future.

C) **Consejo Superior de Investigaciones científicas (CSIC)** (Dates: 13-18 December 2015) Supervisor: Prof. Ana Crespo Solana

Aims and achievements: Working with Dr. José Luis Gasch-Tomás (ER1, CSIC), we consolidated the multiple datasets for WP2 and worked to integrate them into the project database. When Dr. Peter Groenendijk arrived, our discussions on the database continued, but we also began to make arrangements and share ideas regarding ForSEAdiscovery's pending application for European Researchers' Night 2016. We were able to confirm task allocation, possible venues and locations for events, and the distribution of the fellows. The application was submitted in January, but it was unsuccessful. Regardless, going through the process of making an EU application was an extremely beneficial experience.

D) **University of Wales Trinity Saint David (UWTSD)** (Dates: 15-21 May 2016) Supervisor: Prof. Nigel Nayling

Aims and achievements: Working with fellows Marta Dominguez Delmás and Peter Groenendijk (Universidad de Santiago de Compostela, Lugo, Spain), we worked through the 25 samples removed

during the 2016 Yarmouth Roads Shipwreck campaign, noting which samples were most suitable for which type of dendroprovenance analysis, as well as walking through the new digital recording method that I had developed for the archaeological recording of the samples. Discussion meetings and training supervised by Prof. Nigel Nayling and Associated Partner Dr. Aoife Daly (ForSEAdiscovery partner) on performing species identification on archaeological wood samples, which had been provided by a project conducted by the University of Exeter.

ESR3 Dr. Peter Groenendijk (Universidad de Santiago de Compostela)

A) Consejo Superior de Investigaciones Científicas (CSIC), (Dates: 12 October – 7 November 2015) Supervisor: Prof. Dr. Ana Crespo Solana

Activities carried out during secondment:

- Working with and improving the ForSEAdiscovery database, with José Luis Gasch Tomás
- Intensive Training Course (C2) ITN project ForSEAdiscovery (13-16 October): Application of Geographical Information Systems (GIS) to Maritime History and Archaeology
- Lecture at Intensive Training Course (C2): 'Practical Lessons Database and GIS', with José Luis Gasch Tomás, Sara Rich, Peter Groenendijk and María José García Rodríguez
- Open Discussion at Intensive Training Course (C2): 'Dissemination of the Underwater Cultural Heritage.' Chairs: José Luis Gasch Tomás, Sara Rich, Peter Groenendijk and María José García Rodríguez

B) University of Wales Trinity Saint David (UWTSD), (Dates: 2-28 May 2016) Supervisor: Prof. Nigel Nayling

Activities carried out during secondment:

Quantum GIS course

- Assisting Nigel Nayling during sampling of historic building
- Designing and implementation of the 'One Tree Project' in collaboration with Nigel Nayling, and fellows: Adolfo Miguel Martins (ESR6), Antonio Santos (ESR7), and Marta Domínguez Delmás (ESR9).
- Intensive Training Course (C3) ITN project ForSEAdiscovery (23-27 May): Dendroarchaeology of Ships: Prospect and Practice
- Lecture at Intensive Training Course (C3): 'Dealing with stress Workshop'
- Presentation of preliminary results of ongoing individual project at ForSEAdiscovery Project Conference UWTSD: 'Integrating different methods for provenancing ship timbers'

C) Université de Lorraine (UdL), (Dates: 14-25 November 2016). Supervisor: Prof. Anne Poszwa. Nancy – France. Activities carried out during secondment:

- Learned to work in a clean room and with the methods of wood mineralization to extract strontium for isotopic analyses. Steps included: the removal of sea-water influence, extraction of chemical elements with acidic solutions and strontium recuperation using Sr-specific resin columns.
- I presented the wood-sciences work package (WP3) of ForSEAdiscovery project to the lab in Nancy (title: "A potpourri of wood: tree-rings, isotopes, ecology and provenancing"), explaining the methods implemented for dendroprovenancing and their potential.
- During the secondment, I had the opportunity to discuss with ESR Fadi Hajj and Anne Pszwa about the application of strontium for provenancing (including discussing their review paper). Moreover, I

had interesting discussions with the colleagues of the lab about possible future collaborations, how to integrate wood in their research lines, and vice-versa.

- This secondment was crucial to get a better understanding of the Strontium isotopic analyses and how these can be used for the provenancing of wood samples.

ForSEA discovery

