

CONNECTIVITY TIMES

Issue 3, 2022



Dec'21 - May '22

Cyprus hunts treasures...

... to help us to better understand brain and sediment connectivity via high-resolution

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Vienna reconnects...

... not only river side arms, but a whole research network

(page 4)

Brussels has praise...

... for i-CONN for its achievements so far under extremely challenging conditions.

(page 5)

Cyprus in high-resolution

Cyprus has been an enlightening experience in many regards. This includes both ancient and recent history as well as insights into the amazing science that is being carried out from here by our network members from the European University of Cyprus (EUC) and the AAISCS.

Venetia gives an account of the treasures that all participants took home from the i-CONN advanced training on 'high-resolution approaches':

"Starting with an enjoyable field trip, as a 'feet on' experience of how soil, vegetation and landscape properties impact the river flow in a dry environment, how high-resolution topographic data is collected and proceeding with a hands-on session on how this type of data can be used to define and quantify connectivity..."

(page 2)

Cum laude for i-CONN

Everybody understands that carrying out a mobility-heavy research project, such as i-CONN during COVID times is a challenge.

The whole network collectively has been doing a great job and this has been clearly acknowledged during the mid-project review by the European Research Executive Agency (REA): i-CONN received praise, and obviously, also some suggestions on how to improve further; but bottom-line, our network has proven to be strong and resilient.

Our very own Tony Parsons has contributed a nice reflection on i-CONN's achievements so far and, particularly, the REA's evaluation process.

(page 5)

A journey through the natural beauty of Austria

Just like a typical late winter day, our field trip started with a cloudy and rainy forecast. Early in the morning and after a necessary coffee we headed towards one of the most iconic rivers in the world, the Danube. We walked the floodplain trails, admiring the leafless winter forest and hearing stories of past conservation

efforts.

(page 4)

We then set course to the Thayatal National Park. During our tour around the Fugnitz catchment, we had a glimpse of the National Park :

"[...] In this experience, we were able to learn about the impacts that agricultural activities have on soil erosion and ultimately, on the river network, which were often detrimental." (page 5)

Change of heart

A change of a (lion's) heart is something that Richard I might have experienced after his capture by the Duke of Austria. Find out what brought Richard "Lionheart" to Cyprus and who paid for the trip.

(page 4)



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Cyprus in high-res

A Treasure collection from environment and brain networks

Venetia Voutsas

After almost one year of the first missed opportunity to visit the most beautiful island in the world, based on the -totally- objective assessment of Cypriots, it was time to pay off the score and attend a non-virtual event in Cyprus. Based in central and north Europe, visiting the most south-eastern part of Europe was a long journey for the vast majority of i-CONN members.

It was probably the delicious cuisine and the extremely generous food portions the main reasons why we were able to maintain the needed amount of energy to get above the requirements of a challenging advanced course about High-resolution techniques in environmental science and Neuroscience.

Starting with an enjoyable field trip, as a “feet on” experience of how soil, vegetation and landscape properties impact the river flow in a dry environment, how high-resolution topographic data is collected and proceeding with a hands-on session on how this type of data can be used to define and quantify connectivity, we completed the first 2-day part of the workshop by presenting our ideas on the topic and the results of our preliminary analysis.

We were about to meander in the chaotic labyrinths of the human brain, but first things first! The snowy Troodos Mountain, the archaeological site of Kourion, a stroll, some beers and a refreshing quick plunge in the cold waters of Limassol filled our day-off, wisely selected in the exact middle of the course.

Cyprus goes high resolution

1. Connectivity in Geomorphology

- **Field trip:** Data collection by Laser survey (Choirokoitia site)
- **Group work:** Data processing and modelling (MATLAB, CloudCompare)

2. Connectivity in Neuroscience MEG (Magnetoencephalography) based brain-connectivity data

- **Lectures:**
 - “The Neurobiology of Beauty,”
Semir Zeki
 - “Spectral theory of Graph Laplacians and applications”,
Ioannis Michos
 - “MEG in presurgical evaluation of patients with epilepsy”,
Vahe Poghosyan
 - “The functional specialization in the visual brain is projected in time as a perceptual asynchrony”,
Selim Zeki
- **Hands on sessions**



At the second part of our workshop our brain activity could be characterized as adequately intense, since diverse topics about brain connectivity were covered. To briefly name them, we had a live experience on how EEG data (data that record the electrical activity of the brain from the scalp) is collected using the equipment of AISCs, numerous group discussions about connectivity in the brain networks and common points with other disciplines and two talks from ESRs that work in the corresponding fields. At the end of the day, Prof. Semir Zeki gave a special lecture regarding how the experience of beauty correlates with



the activity of the brain.

The importance of Magnetoencephalography-based connectivity analysis in the epilepsy treatment it can be used to evaluate the patients' situation before they undergo surgery was an equally interesting talk whereas, a presentation about the main points of spectral theory of graph Laplacians added a clear mathematical shade in the workshop.

At the end of the week and while some of us were drifting in the clouds on our way back home, the others were basking in the sun in Geroskipou and Petra tou Romiou, where the goddess of beauty surfaced thousands of years ago. And after giving up on trying to find her in the depths of water, we said farewell to this hospitable, sunny place and returned to our home institutions keeping in mind that our network will -physically – re-emerge soon in Bremen!



Neolithic settlement of Choirokoitia, Larnaca



Data collection during our field trip (Choirokoitia site).

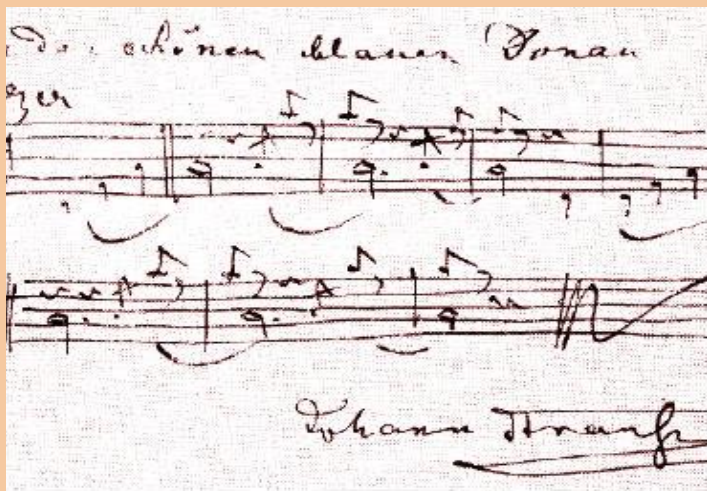


MEG data collection demo in AAISCS.

In Vienna - at the 'blue' Danube

The Danube River has inspired one of the most iconic and well-known waltzes: "The blue Danube". This is just an example of how the world's most international river has been a source of admiration and inspiration for art. But this doesn't come as a surprise, since humans have lived, depended and altered this river for thousands of years. In our experience in Vienna, we got the a glimpse of the long going alterations to this river and the efforts to protect Europe's "blue diamond".

By Sonia Recinos



A journey through the natural beauty of Austria

By Sonia Recinos & John Perez

And we kicked off the year with our i-CONN workshop in Vienna. With an ecological, hydrological and geomorphological focus, we turned our attention to the freshwater systems of the Donau-Auen National Park and the Fugnitz catchment.

The workshop started with a day of introduction to concepts of connectivity in environmental systems where physical, ecological, and even to some extent, social processes were described as well as their feedbacks with each other. Here, connectivity plays a central role to maintain the good ecological status and ecosystem functions of freshwater systems like how efficient sediment is transferred from one part of the catchment to another or permeable is the system to the movement of organisms.

The relevance of these feedbacks and other environmental issues were shared with us by the managers of two of the six national parks in Austria (where both ESRs 8 and 10 are working on). Since not all in the i-CONN network deal directly with environmental systems, these presentations allowed us to appreciate the concepts more through its applied aspects.

It was on the second day of the workshop that we set off on our journey to nature. Just like a typical late winter day, our field trip started with a cloudy and rainy forecast. Early in the morning and after a necessary coffee we headed towards one of the most iconic rivers in the world, the Danube. We walked the floodplain trails, admiring the leafless winter forest and hearing stories of past conservation efforts. To our surprise, the efforts to rescue this endangered ecosystem had in turn contrasting reactions from the local community. For this reason, in the following days of the workshop, the topic of changes in connectivity in the physical and social system was also addressed by the ESRs in one of the groups.

We then set course to the Thayatal National



i-CONN Advanced Course: VIENN VIENNA VIENNA

Vienna (Austria), February 2nd– 4th 2022

● Introduction to water mediated connectivity

Ronald Pöppel

● Theoretical background: Freshwater ecology; floodplain ecosystems; spatial Ecology; hydrological connectivity and its integration to physical and social systems, incl. risk management

Thomas Hein & Andrea Funk

● Putting into practice... Backgrounds of the case study of Donau-Auen National Park and Fugnitz catchment; application of network analyses to assist management

David Freudl, Stefan Schneeweihls

● Field visit

Park. During our tour around the Fugnitz catchment, we had a glimpse of the National Park, where the Fugnitz river runs through, and its confluence with the river Thaya by the old town of Hardegg. We also looked at the agricultural areas that consist the rest of the catchment. In this experience, we were able to learn about the impacts that agricultural activities have on soil erosion and ultimately, on the river network, which were often detrimental. As such, the management of these catchment systems will require proper measures that can be implemented by those working on these agricultural fields to ensure that sediment input into and transfer through the rivers are mitigated.

Both stories only illustrated the complexity of managing social-ecological systems and the need to give visibility not only to the ecological systems, but also to the different voices of the actors that are part of these systems. It was a learning process that culminated in the application of network theory to understand the changing connectivity of the two sites. On the



third day, we brainstormed on how we can use connectivity to address the issues we saw in the field. Coming from different fields, interesting “transdisciplinary” approaches were presented where we were not only limited to approaches from geomorphology and ecology but also applied social and cultural approaches.

And after all the busy days, our exploration to the Danube surroundings continued. This time upstream Vienna, in the land of the Wachau valley and the Venus of Willendorf...



Pre-Vienna: An unusual Interim Review

By Tony Parsons and Jenny King

Everything about our Interim Review was unusual. It is supposed to take place fourteen months into the project: ours took place more than two years after the start. It is supposed to be held in Brussels: ours was an online event. Even that was a last-minute decision. In September we were all set to go to Brussels in December, but then the REA announced that their staff would not be allowed to meet in person until at least the end of the year, but our Review would go ahead at the planned time. After a vote (dominated by the wishes of the ESRs!), it was decided we would have a hybrid event with all of us in Vienna and the assessors joining via

Zoom. But then Austria closed its borders, so the whole thing became a Zoom event.

Nonetheless, the Interim Review and the associated Periodic Report are a crucial milestone in the life of an ITN – if only because successful passage through this stage releases more of the funding for the project. The purpose of the meeting is to assess the fulfilment of all aspects (scientific, training, management, networking, etc.) of the grant agreement and to provide feedback and guidance from the REA and the appointed external assessor for the remaining part of the project. In the event, the delay in holding our Review worked to our advantage. Rather than just being a few months into their projects, the ESRs were well underway. As a result, the presentations gave a much better sense of a clear direction and understanding of the projects. Without exception the presentations by the ESRs were excellent. They all kept to the brief they had been given, but managed to avoid a formulaic presentation, which gave

individual character to each of the projects. Furthermore, it was evident that, despite the pandemic and little in-person contact, the ESRs had managed to forge a real community. Although the Interim Review is about the REA and the external assessor giving guidance and feedback to the ITN, in this case we can usefully offer some in the opposite direction to suggest that the timing of our Review made it far more effective.

We have been expecting a formal report on the Review, but, so far, nothing has appeared. So we begin to think that as far as the REA is concerned the processes is complete. But it is pleasurable to report that comments made during the event and in a subsequent email are complimentary without exception. We hope that everybody left the two days of the meeting feeling as positive about i-CONN as we did – a great pre-Christmas lift. It is a joy to be part of it.



Good ideas across the disciplines

Part of what Shubham has presented in Cyprus has been the product of a very fruitful Datathon in Marseille. It has been the outcome of a team members that were challenging each other's approaches and thereby providing "fresh perspective". He explains in this article, how the teamwork in Marseille had a positive impact on his own work.

"The Importance of Interdisciplinarity in Connectivity Sciences"

By Shubham Tiwari

It is appropriate to begin by stating that interdisciplinarity is the heart of Connectivity Sciences. This interdisciplinary nature of connectivity became clear to me during the i-CONN datathon event in Marseille:

For the workshop, I was part of a five-member team that included physicists, social scientists, and geomorphologists. Following a data-intensive approach, we ended up comparing node importance in our respective complex systems (dryland ecosystems, global multi-regional networks, Chinese national economy networks, scientific collaboration networks, and

procurement networks). Each of us began by presenting our own perspective on node importance, with the vague notion that one's perspective is superior to the others. However, we quickly realized that node importance is highly context dependent because it is determined by how you define importance.

As a result of these discussions and exchanges, we selected multiple node centrality parameters to quantify node importance in our respective complex system.

At first, I was sceptical to use such multicriteria node importance in my research because I do

not work with various types of complex systems; rather, my research focuses on connectivity in dryland ecosystems. However, as time passed, I realized that connectivity in dryland ecosystems has multiple dimensions as well: The overall system behaviour is determined by the various types of connectivity across the landscape, which in turn are determined by individual patch connectivity patterns.

Using the Datathon work as inspiration, I developed a novel *Connectivity Feedback Score* based on multicriteria analysis to identify connectivity hotspots in dryland ecosystems.

This interdisciplinary learning and my research on multiple dimensions of connectivity is still a work in progress, but I believe that our experiences in i-CONN will assist us in developing some interesting perspectives on Connectivity Sciences. To conclude, I would like to quote Prof. Yamir Moreno: "Even if you have a specific problem, you should interact with people from other disciplines, and I believe this will provide a very fresh perspective on what others are thinking about the same problem."



Connecteur of the dots

Over time, several theories emerged about how i-CONN came into being. Anecdotal evidence points to a certain "Connecteur" cost action, where several i-CONN PIs gathered, brainstormed and lay the foundations for our i-CONN network. In Cyprus, however, a missing piece of information came to light: King Richard I. had been here during the Crusades and even captured the Cypriot ruler. This crucial bit of historical connectivity might get us one step closer to understanding the origins of i-CONN ...

"A closer look at the origins of i-CONN going back to the Crusades"

By Marcel Mallow

Try to spin a story of how to get from Brno to Vienna, you can make up a whole lot of things. Gregor Mendel surely travelled back and forth; or he might have already been pretty busy enough counting peas. At least it is safe to say that both Vienna and Brno were part of Habsburg "empire".

However, if we now try to make the connection to Cyprus, we need to start thinking back even further in terms of *historical connectivity*, and chances are, we will settle for the *Crusades*.

One of the rather famous personalities, who participated in the crusades was Richard I (also known as Lionheart, Coeur de Lion or Lö-

wenherz). An observer of the pathways during the Third Crusade, will notice that i-CONN is repeating some of these patterns (see map of crusades on next page). For example, we find an overland path connecting Vienna with Cyprus (at least with some imagination).

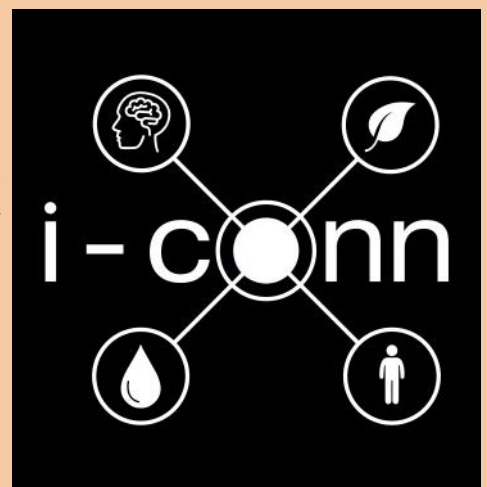
And, more importantly for our little story here, we see that Richard I. during the 3rd Crusade (1189–1192) has stopped in Marseille, to have some Pastis, and then travel on to Cyprus to capture the Cypriote ruler Isaac Comnenus in 1191.

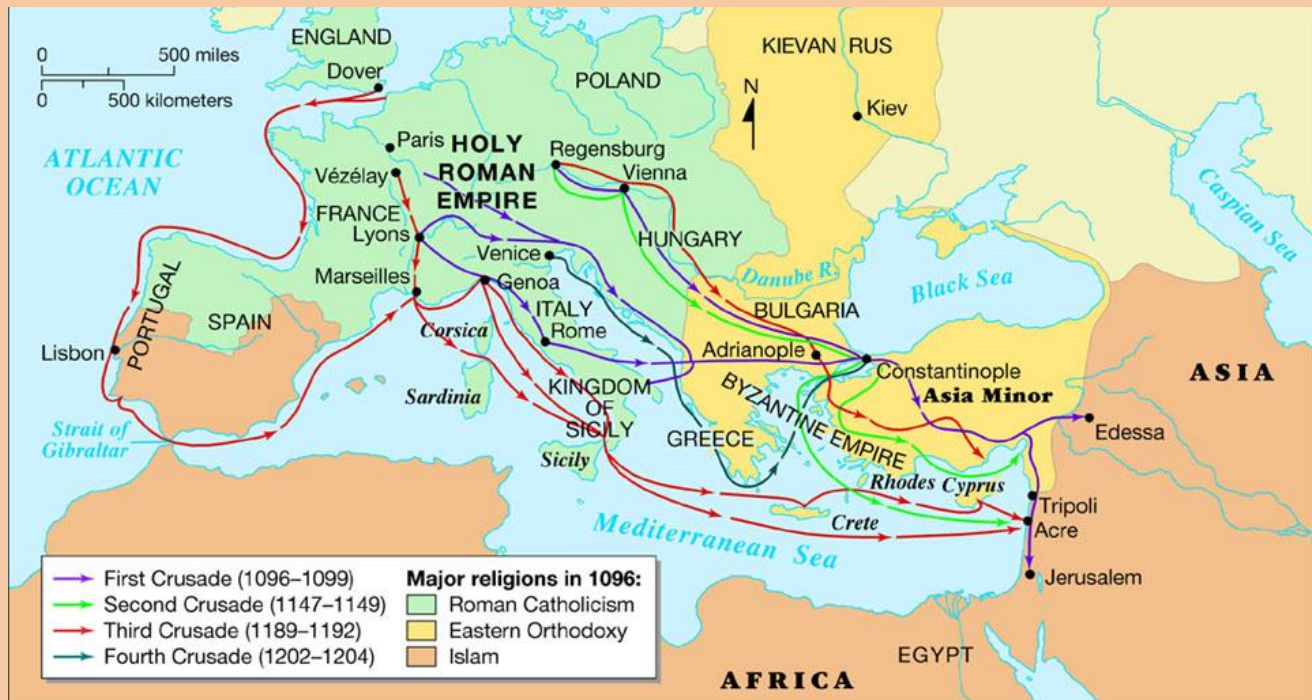
While travelling back from Cyprus in disguise to get back to his kingdom, Richard was cap-

tured by the Duke of Austria and kept imprisoned in a Castle in the picturesque Lower Austrian region of Wachau.

The Wachau is quite a bit upstream from the sights we visited during our Vienna fieldtrip. It is here, where river arms still dream about being reconnected; and it is here, where the air is filled by the sweet scent of 'Marillenknödel'.

It was thus relatively easy for Harald to lure some of us there, with such a history and such culinary delights. Concerning the origins of i-CONN we have learnt that Richard I might well have been a key element in forming our project as it is; or he might not.





The Crusades as an example of Historical Connectivity

Be-tweet-ness centrality

While Twitter is purchased by a single billionaire to take it off the stock market, this **Social Network** has possibly become one of the most important and widely used vehicles to communicate their research. Julia spotted this trend and was part of the i-CONN social media team that kicked off several hugely successful outreach campaigns. She is tweeting to us from Twitter HQ in San Francisco about her venture from “twitter-sceptic” to Social Media Representative.

“The Twitter Test Trial”

By Julia Costescu

I must have set out for myself to join twitter on at least ten occasions since the start of my PhD and I mean to join de facto because of course I have been lurking inactively for a good decade now. I had heard the pro arguments and accepted that they had merit.

After all, so much of academic news and opportunities are now instantly available on social media, and since the pandemic, just as much of the community building and energy has now moved online, so that it seems like shooting yourself in the foot to forgo all that. Then there’s the duty to publicize results and provide outreach on behalf of the project and the science community itself. However, something has always held me back.

Inviting strangers on the internet to instantaneously pick up the thread of your thoughts and also signing up for the unending task of editing your online persona, that can be scary for anyone, let alone a rather private and cautious introvert. So when there was an opening in our social media team, I saw it as an excellent way to dip my toes in, in an anonymous but still immersive way, with the safety net of more veteran twitter users on the team to help bear the load.

And I have come away from the experience thinking that it really does have something very valuable to offer. Far from being addictive, as I had thought, I found it reasonably easy to find a balance between browsing for new content and posting on behalf of i-CONN.



It’s an exciting challenge to try to dig through the endless updates and find the gems in the shape of the most relevant and useful links or opportunities to share. But even more than that,

the most rewarding part has been highlighting the activities and accomplishments of our members, and sharing their enthusiasm, rather than the in-built reward system of likes and shares to which I’ve heard get people so irreparably hooked. Of course, consistency in posting is vital and the whirlwind nature of ESR life did sometimes pose some challenges in keeping it up, but it is a learning curve after all and all in good fun.

Together with my fellow twitter-masters, Deborah and Selim, we had a great time brainstorming and trialling new ways of engaging with i-CONN and the wider science community.

Some formats that we had some fun with were the weekly connectivity question (#ConnQuest) as well as a series rapid fire introductions to our ESRs in a series of tweets.

It wasn't always easy to steal away people's time and attention and we had to get quite creative to find the right incentives, so although I am not too familiar with the metrics used to assess twitter success, I think our stint has gone much better than expected.

So has the experience made me ready to take the plunge? I still have my doubts, especially given current world events, about whether the proverbial great responsibility will always go together with the great power of social media. But at least I am more inclined to believe now that on a personal level it is possible to find a balance and even while keeping a cautious hand on the guardrail to avoid being swept up, still get most of the really unique benefits of that connectedness.

Featured Tweets



Research diaries:

Subgraphs in the service of the Queen

● ESR 7 (Michalis)

For his fascinating blog-post, Michalis dove into the world of chess for us and had a look at the n-Queens problem. He explains different algorithms that manage to identify all possible solutions of the 8-queens problem and communicates some sad news to humanity:

"[...] chess engines use artificial intelligence and neural networks and have surpassed human players in every aspect of the game."



"Mia san jo ned aus Zucker"

● ESR 13 (Deborah)

In her blog post reflection on the Vienna iCONN meeting and workshop, Deborah is brave enough to complain about the changing weather patterns that made all our lives hard during this meeting in February.

She points towards our resilience by using the German saying "we are not made from sugar", but the "Gemischter Satz" wine we had in the taverns after the field trips certainly contained sugar at some point in the process and we enjoyed the end product.



Coming soon...



Entrepreneurship School Bremen, 14 - 17 June 2022

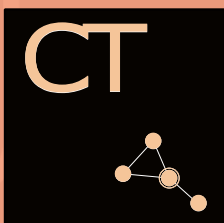
- ◆ *Bring innovation out of the research space, build products, services and business*
- ◆ *Practice and develop skills in a 'safe learning space'*
- ◆ *Work in international and inter-disciplinary teams*

Annual Workshop Bremen, 20 - 22 June 2022

- ◆ *Scientific lectures:* A unified framework of methods and approaches in connectivity science.
- ◆ *Work Package Reports*
- ◆ *ESRs presentations*

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Editors (No. 3)

Venetia Voutsas
Sonia Recinos
John Perez
Marcel Mallow

