Experimental Prosopographical Network Analysis and Visualization with 'Early Modern Letters Online'

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As part of the Mellon-funded Oxford-based 'Cultures of Knowledge' project (http://culturesofknowledge.org), we have been developing an online prosopographical tool for large-scale network analysis and visualization. Prosopography, or collective biography, is concerned with identifying patterns of activity and connectivity in large quantities of biographical data.

After creating a union catalogue of learned correspondence ('Early Modern Letters Online', http://emlo.bodleian.ox.ac.uk), our ambition grew to extend EMLO from a union catalogue with additional research and analysis tools so that it could fulfil the potential of the resource and meet the requirements of a new generation of scholarly users and contributors. The first of these is a prosopographical toolset to facilitate research on the large and sometimes complex social networks that constituted the 'Republic of Letters', the intellectual community of 16-19th-century Europe.

We began last year by developing the data model of the prosopographical tool and collecting data to review the model and to compile a initial dataset for analysis and visualization. The data model is event-based and allows one to capture over a hundred different activities and relationships, in time and space, central to the life of an early modern intellectual. As our first case studies we selected the complementary networks of Samuel Hartlib (c.1600-1662) and John Amos Comenius (1592-1670). The members of their networks were widely dispersed, highly mobile, and included several well-known figures, but also many more figures about whom we know very little. For these reasons Hartlib and Comenius are two good initial choices for representing the large and complex networks we want to unravel by means of prosopographical analyses. Lastly, both figures incorporate a great variety of activities and relationships in their networks. Using a specially prepared prosopographical spreadsheet, the researchers on the project captured a total of 7,063 events for 205 people, involving another 1,028 connected people.

#	Event Category	EventType / RelationshipType	Event name / description	Emlo_ID	Name (surname, forename)	Role of primary participant	Emlo_ID	Name (surname, forename)	Type	Role of secondary participant	year	month	day	uncertain
1	BasicData	Birth		17558	Gronovius, Johann Frederick	Born		-			1611	9	5	
2	BasicData	Death		17558	Gronovius, Johann Frederick	Deceased		-			1671	12	20	
3	BasicData	FamilyRelationships		17558	Gronovius, Johann Frederick	Son	908263	Gronouw, David (d. 1634)	Person	Father				
4	BasicData	FamilyRelationships		17558	Gronovius, Johann Frederick	Son	908264	Langermann, Margaretha (d. 16	Person	Mother				
5	ProfessionalActivity	Employment		908263	Gronouw, David (d. 1634)	Counsellor	908262	John Frederick of Schleswig-Ho	Person	Employer				
6	Education	Study		17558	Gronovius, Johann Frederick	Student	907229	Gymnasium Bremen	Organisation	AcademicInstitution	1626			
7	Education	Study		17558	Gronovius, Johann Frederick	Student	907227	Academic Gymnasium Hambur	Organisation	AcademicInstitution	1626			
8	LocationHistory	Travel		17558	Gronovius, Johann Frederick	Traveller					1631	2		Uncertain
9	LocationHistory	Travel		17558	Gronovius, Johann Frederick	Traveller		-			1631			
10	LocationHistory	Travel		17558	Gronovius, Johann Frederick	Traveller					1631			
8	SocialContacts	Travel		17558	Gronovius, Johann Frederick	TravelCompanion	908265	Unidentified delegates of the D	Group	TravelCompanion				
11	Education	Study	law and literature	17558	Gronovius, Johann Frederick	Student	907233	University of Altdorf	Organisation	AcademicInstitution	1631			
12	Education	Study		17558	Gronovius, Johann Frederick	Student	908266	Ludwellus, Wilhelmus	Person	Teacher				
13	Education	Study		17558	Gronovius, Johann Frederick	Student	908267	Noeslerus, Georgius	Person	Teacher				
14	Education	Study		17558	Gronovius, Johann Frederick	Student	903883	Rittershusius, Konrad (1560-16	Person	Teacher				
15	Education	Study		17558	Gronovius, Johann Frederick	Student	908268	Virdungus, Michael	Person	Teacher				
16	SocialContacts	FirstContact		17558	Gronovius, Johann Frederick	Acquaintance	908269	Kirchmann, Johannes (1575-16	Person	Acquaintance	1633			
17	SocialContacts	FirstContact		17558	Gronovius, Johann Frederick	Acquaintance	900019	Groot, Hugo de	Person	Acquaintance	1633			
18	EcclesiasticActivity	HoldingAnEcclesiasticalOffice	received a vicarage and canonr	17558	Gronovius, Johann Frederick	MinisteringOffice	907487	Cathedral chapter of St Mary's	Organisation		1633			
19	Education	TeachingActivity		17558	Gronovius, Johann Frederick	Tutor	908260	son of Michael Reyniersz Pauw	Person	Student	1634	10		
20	LocationHistory	Travel		17558	Gronovius, Johann Frederick	Traveller		-			1634			
21	LocationHistory	Travel		17558	Gronovius, Johann Frederick	Traveller					1634			
22	LocationHistory	Travel		17558	Gronovius, Johann Frederick	Traveller		-			1634			
23	Education	TeachingActivity		17558	Gronovius, Johann Frederick	Tutor	908260	son of Michael Reyniersz Pauw	Person	Student	1637			
24	SocialContacts	SocialContact		17558	Gronovius, Johann Frederick	Acquaintance	21237	Vossius, Gerardus Joannes	Person	Acquaintance				
25	SocialContacts	SocialContact		17558	Gronovius, Johann Frederick	Acquaintance	9478	Vossius, Isaac (Dr)	Person	Acquaintance				
26	SocialContacts	SocialContact		17558	Gronovius, Johann Frederick	Acquaintance	10565	Heinsius, Daniel	Person	Acquaintance				
27	SocialContacts	SocialContact		17558	Gronovius, Johann Frederick	Acquaintance	903889	Scriverius, Petrus	Person	Acquaintance				
28	SocialContacts	SocialContact		17558	Gronovius, Johann Frederick	Acquaintance	18043	Salmasius, Claudius	Person	Acquaintance				
29	SocialContacts	SocialContact		17558	Gronovius, Johann Frederick	Acquaintance	10567	Heinsius the Elder, Nikolaas (16	Person	Acquaintance				
30	LocationHistory	Travel		17558	Gronovius, Johann Frederick	Traveller					1639	6	23	
31	LocationHistory	Travel		17558	Gronovius, Johann Frederick	Traveller					1639	7	20	
32	Education	PromotionToDegree	De of law	17558	Gronovius, Johann Frederick	Graduate	907496	University of Angers	Organisation	University	1640	2		

(sheet tabs: life events | people | places | sources | roles | glossary | family tree)

Figure 1: Prosopographical spreadsheet for data entry

Early this year we begun to make a start in exploring the requirements and possibilities with regard to database functionality, and analysis and visualization tools that will help scholars of early modern intellectual history in their research. Tanya Gray Jones, a software engineer in the Bodleian Library, our partner in the development of EMLO and of the prosopographical data model, built a demonstrator (using Blacklight, http://projectblacklight.org) that allows us to search a database for names, familial relationships, contacts, locations, educations, occupations, etc., and identify different types of relationships between people, e.g., two people who were blood-related but also studied together at Leiden.

Figure 2: Prosopographical database (faceted, full-text search with dynamic event streams)

In collaboration with Martin Hadley, a data scientist in Oxford's Academic IT Research Support team, we created additional demonstrators (using RStudio Shiny, http://shiny.rstudio.com) for visualizing our data. These sociograms reflect the complexity of the data model and allow one to select a

particular relationship between people within a larger group and to highlight the different types of relationships. For testing purposes, we have used a representative subset of eleven spreadsheets, which number 423 events, involving 617 people and organizations from Hartlib's circle.
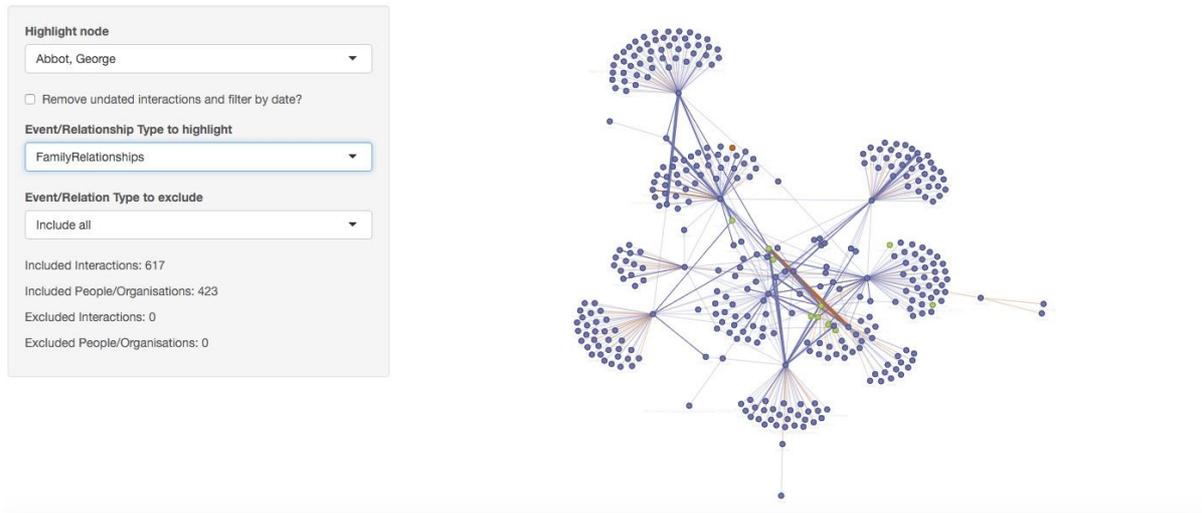

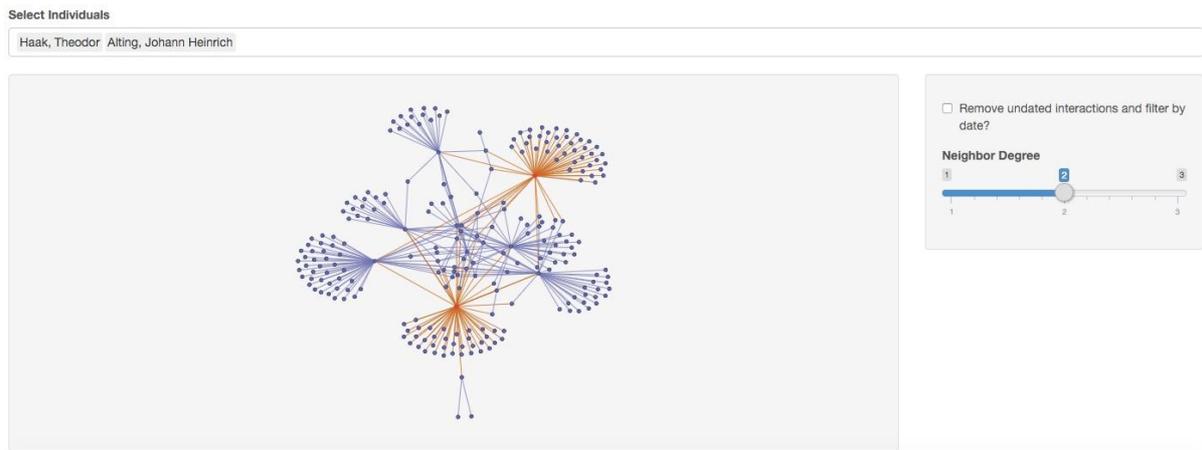**Figure 3: Proof-of-concept visualization of familial relationships**

Figure 4: Proof-of-concept visualization of n-degree connections between two people

Columns to show:
Primary.Participant.Name Primary.Participant.Role Secondary.Participant.Name
Secondary.Participant.Role Event.or.Relationship.Type Category DateOne.Year DateTwo.Year
Date.Type Location.Type.Ahead

Show 25 entries   Search:

Primary Participant Name	Primary Participant Role	Secondary Participant Name	Secondary Participant Role	Event or Relationship Type	Category	DateOne Year	DateTwo Year	Date Type	Location Type Ahead
Gronovius, Johann Frederick	Participant	Haak, Theodor	Participant	Meeting	SocialContacts	1639			London, England
Gronovius, Johann Frederick	Correspondent	Haak, Theodor	Correspondent	Correspondence	SocialContacts				-
Appelius, Heinrich (fl. 1640-58)	Acquaintance	Haak, Theodor	Acquaintance	SocialContact	PeerRelationships				-
Arnold, Nicholas	Acquaintance	Haak, Theodor	Acquaintance	SocialContact	PeerRelationships				-
Haak, Theodor	Son	Haak, Theodor, father of Theodor Haak (1605-1690)	Father	FamilyRelationship	FamilyRelationships				-
Haak, Theodor	Son	Tossanus, Maria, also Toussaint	Mother	FamilyRelationship	FamilyRelationships				-

Figure 5: Table with all events involving an individual selected in the graph

The database and visualization tools are proofs of concept and not yet ready to be integrated into EMLO. They form the starting point for further reflection on the kind of database functionality and visualizations that would suit the needs of scholars of early modern intellectual networks and help them answer their research questions. They could be used, e.g., to investigate to what extent Hartlib's network was centred on him, or to test the hypothesis that the basis of this network was formed by people who knew each other from their studies at the Reformed academies in Germany. They are also instrumental in verifying that the data model itself is suited for exploring what specific problems arise with respect to common issues, such as incomplete data, duplicate or conflicting events, and different types of uncertainties.