1a. Details of applicant

-Name, title(s)   Maria Aloni, Dr.
-Adress for correspondence   ILLC/University of Amsterdam
                                                                Nieuwe Doelenstraat 15
                                                                1012 CP Amsterdam
-E-mail: M.D.Aloni@uva.nl
-Website   http://staff.science.uva.nl/~maloni/

1b. Title of research proposal

Indefinites and beyond – Evolutionary pragmatics and typological semantics

1c. Summary of research proposal
(max. 300 words, plus max. 5 KEYWORDS)

Hearers can and do infer information beyond what speakers actually say. Grice was the first to attempt an explicit account of these inferences as the product of rational interactions between cooperative language users. Since then the relationship between pragmatic inference and grammar has been the subject of a debate in linguistics, which hasn't reached firm conclusions yet.

This project intends to contribute to this debate focusing on one phenomenon that appears to be an important source of insights on this issue: the diversity of indefinite constructions that can be observed both within and across languages.

The main empirical goal of this project is to arrive at a principled explanation of this diversity. Our first hypothesis is that the wealth of indefinite morphology emerged as the result of processes of conventionalization of originally pragmatic inferences. We plan to formalize the integration of pragmatic inference into grammar using mechanisms of propositional quantification that are widely held to play a role in the semantics of questions and focus. Our second hypothesis is that the difference in meaning and distribution of the various indefinite forms can be explained in terms of their association with different matching propositional quantifiers.

Formal studies of natural languages are often based on a limited set of English data. Empirical studies, on the other hand, often lack the formal rigor and generality necessary for the kind of explanatory account formal studies strive for. This project aims at an interdisciplinary collaborative effort. Empirical studies will help determine what functions, meanings and distribution patterns (i) are particularly widespread in the languages of the world, (ii) have emerged earlier, (iii) occur more frequently. Formal theories will be developed to gain a better understanding of these functions and patterns and to arrive, eventually, at an explanatory semantic/pragmatic model of diachronic and typological variation.

Keywords: indefinites, formal semantics, formal pragmatics, language evolution, typology

2. Description of the proposed research

(Words used 3966)

2a. Research topic

Empirical domain Individual languages possess a wealth of indefinite forms (forms whose main function is to express indefinite reference) that relate to each other in

complex ways (Haspelmath-1997). English, for example, has at least four different indefinite determiners: *a, some, any, one*. Italian has many more including *uno, nessuno, qualche, (uno) qualsiasi/qualunque, qualsivoglia*. These various forms typically differ in distribution and interpretation, but seem to have a common logical/semantic core. For example, consider *any* and *some*. There are contexts where they can be used without a great meaning difference (Conditionals: *If you hear something/anything, call me*), others in which they cannot be interchanged (Negations: *I didn't meet someone/anyone,* permissions*: You may kiss someone/anyone,* episodic: *I kissed someone/#anyone).* Italian free choice indefinite *qualsiasi* behaves like *any* in permissions and episodic sentences. However, it is ungrammatical in negative or conditional sentences, and, therefore, differs from *any* in this respect (Chierchia-2004, Aloni-2006b). Scandinavian wh-*som helst* (Saebo-2001), Lezgian *xajit'ani,* and other indefinites in other languages appear to behave like Italian *qualsiasi*. The CL-*ote*-series in Swahili or Latvian *ar bith*, instead, seem to behave like English *any*. Interestingly, the German *irgend*-series exemplify yet another distribution/meaning pattern, resembling *any* in permissions, but being closer to *some* in episodic sentences (Kratzer-&-Shimoyama-2002).

Many theoretical questions arise from these observations. Why is there so much cross-linguistic and language-internal variation in indefinite forms? What is the common core of these various indefinites? What is specific to each of them? Why did some typological patterns emerge rather than other? And why is there so much diversity in genetically and geographically related languages (English, German, Scandinavian) but also relative similarity in unrelated languages (e.g. Romance and Lezgian with respect to free choice)? The main empirical goal of the present project is to reach a principled answer to these questions.

The study of indefinites have inspired among the most important theoretical breakthroughs in logical analyses of natural language interpretations. For example, divergences in meanings between *some* and *or*, on one side, and their formal counterparts, the existential quantifier and logical disjunction, on the other, constituted the original motivation for Grice's notion of an implicature (pragmatic inference) and, therefore, for the whole enterprise of formal pragmatics (Grice-1989, Horn-1972, Gazdar-1979, Levinson-1983,2000). In the beginning of the 80's, the attempt to simultaneously characterize the quantificational and 'discourse-reference' properties of indefinites motivated the dynamic approaches to meaning creating a new paradigm that, since then, has been successfully applied to a large number of phenomena including presupposition, tense, information structure (Kamp-1981, Heim-1982, Groenendijk-&-Stokhof-1991, Dekker-1993). Formal studies like these, however, are often based only on (a limited set of) English data. Empirical studies, on the other hand, often lack the formal rigor and generality necessary for the kind of explanatory account formal semantics and pragmatics strive for. With this project we aim at an interdisciplinary collaborative effort. Empirical studies will help determine what functions, meanings and distribution patterns are particularly widespread in the language of the worlds, have emerged earlier, occur more frequently, etc. Formal theories will be developed to gain a better understanding of these functions and patterns and to arrive, eventually, at a unified framework that has the rigor and generality necessary for an explanatory semantic/pragmatic account of typological and diachronic variation.

Working hypotheses Our **first hypothesis** is that the variety in the *morphology* of indefinites emerged as the result of various processes of conventionalization, grammaticalization or 'fossilization' of genuinely pragmatic phenomena (e.g. Levinson-2000). Hearers can and do infer information above and beyond what speakers actually said. If you ask me what George looks like and I say that he has a

good personality, you normally conclude, far beyond the literal meaning of my utterance, that he is not attractive. Grice was the first to attempt an explicit account of these types of inferences as the product of rational interaction between cooperative language users. Uses of indefinites can give rise to a large number of pragmatic inferences from scalar implicatures to ignorance, indifference and free choice effects. For example, when told that you may marry an Italian, you normally conclude that that each Italian is a permissible option (free choice implicature), unless there is a specific Italian you may marry, but the speaker doesn't know which one (ignorance implicature). A number of authors have shown that these implicatures can be derived by purely conversational means assuming a plain existential meaning for the original sentence (e.g. Schulz-2003,2005, Aloni-2005b). Our hypothesis is that these inferences, pragmatic in origin, have been ultimately conventionalized giving rise to different indefinite forms. For example, free choice items like Lezgian *xajit'ani*, would exemplify cases of fossilization of the free choice implicature, the various 'dunno'-indefinites recognized in Haspelmath (1997), e.g. Middle High German *neizwer* might be cases of fossilization of the ignorance implicature. From their original function as free choice or specific-unknown, these forms might then have extended to other functions (*xajit'ani* to comparative uses, *neizwer* to non-specific uses, Haspelmath-1997, pp.148-156) following patterns of semantic change that will have to be investigated. In pursuing this first hypothesis, we expect (i) to arrive at a principled explanation of why some typological patterns have emerged rather than others and, more in general, (ii) to contribute to the development of a model of language evolution as the result of conventionalization of rational cooperative behavior.

The question now arises how these pragmatic inferences have eventually been integrated into grammar resulting in the observed differences in distribution and meaning of the various indefinite forms. To formalize the final stages of these processes of fossilization we will employ mechanisms and structures that are widely held to play a role in the semantics of questions and focus (e.g. Hamblin-1973, Karttunen-1977, Groenendijk-&-Stokhof-1984, Rooth-1985, Aloni-Butler-Dekker-2007): propositional alternatives, propositional quantification and exhaustification. This methodological choice finds empirical support in the fact that many languages employ interrogative morphology and/or focus particles to form indefinite constructions (cf. the Dutch free choice indefinite *wie dan ook* literally meaning 'who then also', or the Italian 'ignorance/indifference' indefinite *chissachì* literally meaning 'who knows who', see also Giannakidou-&-Cheng-2006 for Greek and Mandarin Chinese, Haida-2005 for German). The logic of alternatives presented in Aloni (2002,2003,2006a), and the Hamblin semantics presented in Kratzer & Shimoyama (2002) are concrete examples of such formalizations. These accounts identify the common meaning of various indefinite forms in their potential to give rise to sets of propositional alternatives, in much the same way as questions do. If I say that someone called, I suggest that I don't know who called as much as if I ask who called. Sets of propositional alternatives (e.g. (only) John called, (only) Mary called,...) are formal ways to represent this state of ignorance. Propositions can be true or false, sets of propositions cannot. To bring these sets back to the level of a single proposition, a number of different operations may apply: existential or universal quantification, universal negation, etc. Our **second hypothesis** is that the difference in *meaning* and *distribution* of the various indefinite forms derives from their necessary association with different matching operations either directly via syntactic agreement (Kratzer-&-Shimoyama-2002), or indirectly via lexically encoded pragmatic conditions (Aloni-2002,2003,2006). Approaches based on this hypothesis have reached considerable empirical success in explaining otherwise puzzling intervention effects (Kratzer-2005) and the distribution and meaning of a number of

indefinite forms in different languages (e.g. Menendez-Benito-2005 for Spanish, Abrusán-2006 for Hungarian, Kim-&-Kaufmann-2006 for Korean and Aloni-2006b for Italian). In this project, we expect to (i) further develop these theories to extend their empirical coverage; (ii) to motivate them, in particular the alleged emergence of mechanisms of propositional quantification, via the described diachronic perspective; and (iii) to test their generality by applying them to other domains, notably coordination.

Illustration As a concrete illustration of our hypotheses, consider the case of free choice indefinites (e.g. Dayal-1998, Quer-2000, Giannakidou-2001, Saeboe-2001). For ease of explanation, consider English *any* in its free choice use. As we saw, free choice *any* is felicitous in permissions like (1a), where it gives rise to the free choice inference: *for each x, kissing only x is a permissible option* (Menendez-Benito-2005), but needs a post-nominal modifier to be felicitous in episodic sentences: (1b) is out, but (1c) is felicitous and obtains a universal interpretation.

(1)   a. Joe may kiss anybody.
        b. # Joe kissed anybody.
        c. Joe kissed anybody with a red hat.

Ideally, the distribution of *any* and its meaning should receive a unified explanation.
       A number of authors (e.g. Aloni-2005b).have shown that from (2a), which can be taken as the original logical rendering of (1a), we obtain via purely conversational/pragmatic means the free choice inference of the sentence represented in (2b) (where $\exists$ and $\forall$ are the existential and universal quantifiers respectively).

(2)   a. Original existential sentence: **MAY**$(\exists x\ kiss(j,x))$
        b. Conversational implicature: $\forall x(\textbf{MAY}(ONLY_x\ kiss(j,x)))$

Our **first hypothesis** is that specialized free choice morphology has emerged as result of a process of fossilization of this originally pragmatic inference. We may hypothesize at least three diachronic stages wherein languages gradually developed free choice morphology (cf. Levinson-2000 on reflexives):

   • **stage 1** Languages with no specialized free choice morphology
   • **stage 2** Languages in which emphatic indefinites may prefer free choice interpretations
   • **stage 3** Languages with free choice morphology

Haspelmath (1997) cites a considerable number of languages that appear to do without specialized words that encode free choice meanings, and, therefore, appear to exemplify stage 1. A language may be said to have reached stage 2 when it has developed a more or less specialized expression for free choice uses. These expressions are not true free choice items, because they are not necessarily interpreted as such. A candidate for a stage 2 language is German. The emphatic expression would be *irgendein*, which must be stressed to get a free choice interpretation and whose free choice effects are defeasable (Kratzer-&-Shimoyama-2002). Italian, Lezgian and many other languages appear to be examples of stage 3 languages with specialized free choice morphology. To further verify this hypothesis, such gradual emergence of free choice morphology should be attested also in a single language. To this aim a diachronic study of a stage 3 language is included in our plan.

In stage 3 languages, inference (2b), pragmatic in origin, has been integrated into the meaning of sentences like (2a). Menendez-Benito (2005) and Aloni (2006b) propose to represent the resulting logical form of these sentences as illustrated in (3).

    (3)   Logical form after fossilization: [∀](**MAY**([ONLY]∃x kiss(j,x)))

In (3), [ONLY] is a conventionalized version of pragmatic exhaustification (Schulz-&-vanRooij-2004,2006); and [∀] is a (covert) operator quantifying over the propositional alternatives induced by the existential sentence. [∀] says that each of these propositions (in this case: that Joe kisses only Mary is possible, that Joe kisses only Bill is possible, etc.) is true. Our **second hypothesis** is that distinctive free choice morphology has emerged as an indication of obligatory association with these two covert operators. As shown in Aloni (2006b), this hypothesis gives us a principled explanation of the facts in (1). The contrast between (1b) and (1c), for example, can be explained in terms of interaction between [∀] [ONLY] and standard type shift and lambda operations.

In this project, we aim to find empirical support for these hypotheses about free choice, and to formulate and support parallel hypotheses on the emergence and/or semantic change of other indefinite forms.

Objectives To summarize, the main empirical goal of the present project is to reach a principled explanation of the cross-linguistic and language-internal diversity of indefinite forms. The main **hypotheses** we will be exploring are:

- The variety of indefinite forms originated from the fossilization of various pragmatic effects.
- Pragmatic inferences enter grammar via mechanisms of propositional quantification.
- Distinct indefinite forms indicate association with different matching operators, explaining so the cross-linguistic and language-internal variety in meaning and distribution.

In pursuing these hypotheses we aim at the following theoretical objectives:

- **Objective 1** The development of a model of the evolution of indefinite forms as the result of conventionalization of rational cooperative behavior.
- **Objective 2** The development of a model for the explanation of their synchronic diversity in meaning and distribution.

In order to come up with typological and historical generalizations a proper empirical domain is required. This leads us to the formulation of our third and fourth objectives:

- **Objective 3** A *diachronic study* to provide empirical evidence to the alleged fossilization of various pragmatic effects into different forms.
- **Objective 4** *A cross-linguistic corpus study* to assess the statistical relevance of the various indefinite forms and their functions.

2b. Approach

The four objectives identified above will be pursued in four distinct work packages (WPs):

- **WP1** *Conversational implicatures and their fossilization* directed towards the first objective. Intended postdoc investigator: Katrin Schulz;
- **WP2** *Cross-linguistic and language-internal diversity of indefinites and other forms* directed to the second objective and carried out by the applicant;
- **WP3** A PhD project, *Diachronic studies and theoretical evaluations* pursuing the third objective. The ideal candidate will have the ability to collect and analyze primary data in order to address theoretical issues.
- **WP4** *Cross-linguistic corpus study* directed towards the fourth objective and carried out by all project partners.

WP1 We identify three main tasks for WP1:

- Development of a unified framework to derive conversational implicatures from assertive and non-assertive sentence types.
- Development of a framework to explain their diachronic fossilization.
- Application of the framework to indefinites and other phenomena.

As for the first task, a unified formalism for scalar, ignorance, indifference and free choice implicatures is still missing. Some work has already been done (e.g. Sauerland-2004, Spector-2004, Schulz-2003,2005, Schulz-&-vanRooij-2004,2006, Aloni-&-vanRooij-2004, Fox-2006, Aloni-2005b). However, most existing accounts focus exclusively on implicatures of assertions (one exception is Aloni-2005a). Pragmatic inference, however, is not restricted to assertions. It arises from questions (*Do you know what time it is? => Tell me the time please*!) and imperatives (*Have a soup or a salad! => Don't have both!)* as well. One of the first tasks of this WP is an empirical study of these cases and the development of a formalism that explains their emergence. Schulz (2003,2005), Schulz and van Rooij (2004,2006) and Aloni (2005a,b) will be taken as starting points for such a formalism.

As for the second task, examples of implicated meanings as source of grammatical change can be found throughout the grammaticalization literature (e.g. Bybee et al.-1994, Hopper-&-Traugott-1993). Diachronic analyses of definite pronouns in strictly Gricean terms have been proposed by Levinson (2000) and formalized by Matthaush (2004) in the framework of Bi-directional Optimality Theory (Blutner-2000, Zeevat-2002). In this project we want to extend these ideas to the domain of indefinite constructions to explain, in a principled way, why some typological patterns have emerged rather than others. The answer we seek to give is that certain patterns emerged because of evolutionary pressure. To this aim we will take as theoretical starting points the theories of language evolution that have been developed in terms of iterated learning (Kirby-&-Hurford-2002) and evolutionary game theory (Jäger-2003, van-Rooij-2004). We will start by a comparison and possibly integration of these theories with Eckardt's (2001,2003) account of semantic change in terms of structural reanalysis. Ultimately, we would like to arrive at a unified model of the evolution of indefinite forms as the result of conventionalization of rational cooperative behavior. One challenge is to find empirical evidence for such a model. For this task we plan a close collaboration with WP3.

In the third year of the project, we expect to apply the developed model to other phenomena, in particular constructions involving fossilized versions of originally pragmatic operations of maximalization/exhaustification like embedded interrogatives (Groenendijk-&-Stokhof-1984), free relatives (e.g. Jacobson-1995), degree relatives (e.g. Grosu-&-Landman-1998).

WP2 We identify three main tasks for this WP:

- Development of a unified formalism for an explanation of synchronic variations in indefinite forms.
- Empirical application to the indefinite forms of English, German, Dutch, Italian and Hungarian.
- A further application of the formalism to the domain of coordination.

Important theoretical work towards the first objective has already been done, for example, in the recognition of the role of (i) domain widening (e.g. Kadmon-&-Landman-1993), (ii) implicatures (e.g. Krifka-1995, Schulz-2003,2005, Chierchia-2004), (iii) interrogatives and exhaustification (e.g. Menendez-Benito-2005, Giannakidou-&-Cheng-2006, Aloni-2006b), (iv) scalar particles (e.g. Lee-&-Horn-1994) and (v) focus (e.g. Lahiri-1998). Stepping back, however, we witness a fragmentation of the field as a result. Each of these elements seems to be important, however there is confusion about their specific role, and despite a number of comparisons and attempted correlations (e.g. Chierchia-2004), no unifying framework has emerged that has the formal rigor and generality necessary to set the standards for an explanatory semantic/pragmatic account of typological variation.

Our starting point will be the logic of alternatives developed in Aloni (2002,2003,2006a). This logic has the advantages that (i) it can be axiomatized (Aloni and ten Cate, in preparation), and, therefore, is feasible for computational applications and (ii) it can be easily made dynamic (Dekker-2002), and, therefore, constitutes a proper framework to study the possibly different discourse properties of the various indefinites. This system will be compared and possibly integrated with Kratzer & Shimoyama (2002), and Chierchia (2004,2005). Special attention will be given to the role of domain widening and exhaustification. We further plan for this phase an empirical study of the discourse properties of the various indefinites and their relation with accent and focus.

As for the second objective, in order to test the empirical adequacy of the developed framework, we plan to apply it to the various indefinites in English, Dutch, German (to study family internal variations), Italian (as representative for Romance), and Hungarian (as representative of a third language family). Existing typological studies will be taken as primary sources of data as well as the results of WP4.

As for the third objective, in order to test the generality of the approach we intend to apply its principles to another domain: coordination. (Kamp-1973, Zimmermann-2000, Geurts-2005, Simons-2005, Alonso-Ovalle-2006). Coordinate constructions, in particular disjunctive forms show typological and language-internal variation similar to indefinite constructions, although to a lesser extent (Haspelmath-2004). As an illustration recall the contrast in meaning between *some* and *any* in negative sentences. *I didn't meet anyone* means I met nobody, *I didn't meet someone* means there is a specific person I didn't meet. Italian disjunctive form *o,* contrary to English *or*, appears to behave like English *some* in these contexts. English *I didn't meet Giacomo or Lorenzo* means, on its preferred reading, I met neither Giacomo nor Lorenzo. The Italian counterpart *Non ho incontrato Giacomo o Lorenzo* can only mean I didn't meet Giacomo or I didn't meet Lorenzo, with *o*, like *some*, typically outscoping negation. Hungarian *vagy* behaves like Italian *o,* as has been observed by Szabolcsi (2002), who further distinguishes for Hungarian at least two other disjunctive forms: *vagy…vagy*, and *akàr...akàr*, the latter is particularly interesting for our purposes in that it only occurs in typical free choice contexts. These facts suggest disjunction as a natural test domain for our framework. In addition, uses of indefinites and disjunctions give rise to the same pragmatic effects. These effects have been grammaticalized to a lesser extent for disjunction than for

indefinites probably due to the difference in frequency between the two constructions. Significant with respect to this issue might be the emergence in many languages (e.g. Finnish, or Mandarin Chinese) of distinct disjunctive morphology for uses in interrogatives (Haspelmath-2004). Disjunction, indeed, seems to occur more frequently in questions than assertions. To confirm this and other hypotheses a corpus study on uses of disjunctions will also be carried out during this phase.

Since the diachronic model developed by WP1 is meant to motivate the synchronic model developed in WP2 we expect close collaborations between these two WPs throughout the whole project.

WP3 We identify three main tasks for this WP:

- To provide empirical evidence to the alleged fossilization of various pragmatic effects into different indefinite forms;
- To arrive at theoretical evaluations of this evidence building on the frameworks developed within WP1 and WP2;

As for the first task, we plan to carry out a number of diachronic studies with the following objectives: (i) to attest the emergence of *free choice* and *specific-unknown* morphology as the result of gradual fossilization of free choice and ignorance implicatures, respectively; and (ii) to study the patterns of semantic change from free choice and specific-unknown to other functions. Haspelmath's (1997) chapter 6 and 7 will be taken as starting point for these studies. The choice of the language(s) will depend on the availability of suitable texts and the competence of the PhD candidate.

As for the second task, the diachronic changes identified in these studies will be evaluated and fully explained using as starting points the formal frameworks developed in WP1 and WP2.

The thesis will be written under the supervision of Prof. Jeroen Groenendijk.

WP4 We identify one task for this WP:

- A cross-linguistic corpus study to assess the statistical relevance of the various indefinite forms, but also of their various functions (e.g. those recognized in Haspelmath's (1997) implicational map)

The corpus study will involve all project partners. The languages involved include English, Dutch, German, Italian, Hungarian and eventually a sixth language depending on the competence of the PhD candidate and the availability of suitable corpora. At least for English for which we have phonologically annotated corpora, we expect this study also to shed some light on the relation between nuclear accent and various uses of indefinites.

2c. Innovation

The main challenge and originality of the project is to make the techniques from formal semantics and pragmatics applicable to the empirical fields of typology and diachronic linguistics. Its scientific significance lies in its contribution to the debates concerning the grammar/pragmatics interface, and the nature of language universals: what is universal across languages might be the pragmatic mechanisms that govern grammar creation, rather than language-internal rules. On the empirical side, our main contribution is a principled explanation of the diversity of indefinite constructions. The principles behind this explanation will be further applied to explain

the typological and language internal variety of coordinate constructions and the grammaticalization of operations of exhaustification. With this project we expect important innovative contributions to the fields of: (i) formal semantics and pragmatics; (ii) typology; (iii) historical linguistics; but also (v) computational semantics/pragmatics (dialogue, question-answer system).

2d. Plan of work

The following table provides an overall time schedule for each of the wps identified in the previous section.

tasks	year 1	year 2	year 3	year 4	year 5
WP1:					
Implicatures	■				
Fossilization	▪	■			
Applications			■		
WP2:					
Indefinites: synchronic model	■				
Indefinites: applications		■			
Coordination			■	▪	
Proof theory				▪	
Write monograph					■
WP3:					
Diachronic studies	■	▪			
Theoretical evaluation		▪	▪		
Write PhD thesis			■		
WP4:					
Corpus studies	▪		▪		

Cooperations The diachronic studies will be done in collaboration with Regine Eckardt in Göttingen, and Hedde Zijlstra (UvA). The corpus studies will be done in collaboration with Paola Monachesi (Utrecht University) and Khalil Sima'an (ILLC). The proof theoretical part will be done in collaboration with Balder ten Cate (CWI, Amsterdam). We further plan collaborations with Chierchia (Harvard) and various people from the ILLC including Balogh (focus, Hungarian), Blutner, Zeevat (BiOT), Dekker (dynamics) Groenendijk & Stokhof (dynamics, questions), van Rooij (evolutionary game theory), Veltman (conditionals, modals), and have contacts with Beaver (Austin), Kratzer (UMass-Amherst), Jäger (Bielefeld), Zimmermann and Schwager (Frankfurt), Giannakidou (Chicago), Quer (UvA), Clark and Kaufmann (Northwestern), Alonso-Ovalle (Massachusetts), Min-Joo Kim (Texas Tech). In order to establish further contacts with the empirical community we plan the organization of two interdisciplinary workshops in year 2 and 4.

Visits (i) The applicant will visit Boston to collaborate with Chierchia (Harvard), Menendez-Benito, Abrusan, Fox (MIT), (ii) the post-doc will visit the Centre for General Linguistics, Typology and Universals Research (ZAS) in Berlin; and (iii) the PhD student will go to Göttingen to work with Regine Eckardt.

Dissemination International journals and conferences with peer review will be the

main dissemination channels, as well as book contributions or books. In particular we plan to write a monograph in order to clarify the unified perspective behind the research.

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