Registration form (basic details)

1a. Details of applicant
- Name, title(s): Andreas Flache, dr., ma. computer science (dipl. inf).
- Male/female: Male
- Address for correspondence: ICS, RUG
  Grote Rozenstraat 31
  9712 TG Groningen
- Preference for English correspondence: no
- Telephone: 050-3636214 (sec: 050-3636220, home: 050-5251477)
- Fax: 050-3636226
- E-mail: a.flache@ppsw.rug.nl
- Website (optional): www.ppsw.rug.nl/~flache
- Use of extension clause (see Notes): no
(if 'yes', give reasons and calculation)

1b. Title of research proposal
The importance of timing and structure: modelling effects of interpersonal contacts on social cohesion in diverse groups.

1c. Summary of research proposal
The way policy-makers and social scientists think about social cohesion is strongly influenced by the contact hypothesis: contacts between culturally different people improve their interpersonal relationships and thus foster social cohesion. A prominent example is the policy to assign schoolchildren from so-called “black-neighbourhoods” to mixed schools. However, empirical tests of the contact hypothesis in various realms show a complex picture.

Various research lines study under which conditions contacts may foster cohesion. We aim to innovate this research through a systematic integration of three hitherto unrelated fields. Due to this integration we can identify previously unrecognized conditions under which contacts may foster cohesion in different empirical realms. In particular, we suggest that cohesion may be a matter of timing and network structure of contacts, conditions that can be utilized for policy design. We draw on formal computational models of social differentiation to generate precise predictions about the conditions and dynamics of social cohesion. Our innovations in this research line will be a systematic combination of positive and negative effects of social contact (assimilation and rejection) and an empirical test of underlying micro-level assumptions. We employ for the empirical test recently developed statistical techniques and datasets from studies of intercultural friendship networks. We aim to advance these studies by feeding their results about micro-level processes back into our formal analysis of the structural determinants of social cohesion. Finally, we incorporate a condition for group cohesion that was suggested by recent research on subgroup formation in work teams but has been overlooked by the other lines of study: so-called “faultlines” caused by clustering of members’ demographic attributes. Our new theory will first be tested in controlled group discussion experiments. Subsequently, field tests will be conducted on intercultural friendship networks in schools and on culturally diverse work groups.

Keywords:
contact hypothesis, computational modelling, social network dynamics, intercultural relationships, social cohesion

1d. NWO Council area Social and behavioral sciences (MaGW)

1e. Host institution (if applicable) RUG
2. Description of the proposed research

2a. Research topic

Maintaining social cohesion in demographically and culturally diverse groups is a challenge for modern societies. The corresponding scientific question is why diverse groups differ in cohesiveness, that is: in the extent to which group members are tied to each other by good interpersonal relationships (MW03). It is well known that people may feel attracted towards each other when they are similar in demographic characteristics (e.g. age, ethnicity) or embrace similar social norms, e.g. a similar dress code or religious denomination (Byr71;Ne63). But when might demographically diverse people come to agree on social norms? Contact is widely seen as an important part of the answer. The corresponding contact hypothesis (Pet98;All54) – with roots in classical sociology (Du64) – suggests that contacts between diverse people improve interpersonal relations (Pet98;For97) and thus group cohesion. Contacts – such as sharing the same neighbourhood, school class or work team – expose people to each other and entail at least some communication and interaction. Such contacts have been found to increase intermarriage between ethnic groups (BS97;Bla77) and formation of other cross-group social relationships (QC03;Mar90;HS85). This view resonates prominently in the recent debate in the Netherlands whether schoolchildren from so-called “black-neighborhoods” should be send to mixed schools.

Effects of contacts on cohesion are complex, however. Common membership in sports clubs has been found to promote agreement between culturally different people (Eri96), but people also often reject others’ cultural preferences (e.g. music, fashion) in contacts (Mar03;Bou84). In studies of inter-ethnic relations, some found contact to improve attitudes about other ethnicities (PE95;EP94) but others showed that mixing of ethnic groups in schools may result in stronger preferences for same-ethnicity friendships (Mo01), particularly for small minorities (QC03). Recently, this has also been observed in dutch schools (Baerveldt, personal communication). Finally, organization research showed that mixing employees from different nationalities or disciplinary backgrounds in work teams often results in conflict rather than cooperation (TJZ03;WD01;EM00;JNN99).

These are clearly important findings. However, we argue that previous research overlooked important conditions that modify how contacts affect cohesion. In particular, we propose a new research topic: effects of the specific timing and the specific network structure of contacts, that is: who is when brought into contact with whom. Effects of timing and network structure on the dynamics of social cohesion in diverse groups have hitherto not been analyzed systematically, but could clearly be important for interventions, for example for forming school classes or for work team composition. To adequately study this topic we will integrate three widely disconnected fields of study that all address effects of contacts on cohesion, but that are separated by diverse frameworks and empirical realms, notably formal models of social differentiation (FM04;MKF03;Mar03;Mar98a,b;HF/M00;Ax97;LN97;Si/Z6;Zeg95;Car91;Car86;NSL90), studies of the cultural segregation of friendship networks (QC03;Vdu03;Mo01;BS94;HW87;HS85), and research on subgroup formation in work teams (Sha04;TJZ03;GV03;EM00;LM98;PMN98). Two additional innovations follow from the proposed integration. First, we develop a formal explanatory model that integrates for the first time microlevel mechanisms that were hitherto not systematically combined, notably positive (“assimilation”) and negative (“rejection”) effects of interpersonal contacts. Second, due to this integration, we can identify previously unrecognized conditions under which “us vs. them” divisions may arise from negative effects of contacts in diverse groups.
We aim to combine complementary strengths of the research lines in order to contribute to the advancement of each. We derive from formal models of social differentiation explicit quantitative assumptions about the micromechanisms through which interpersonal contacts affect interactants’ norms. We discuss these micromechanisms in 2.b. These models generate predictions about effects of frequency and range of contacts in a population on cultural convergence (cf. Mar98a;Ax97). However, hitherto the specific timing and the network structure of contacts were neglected. We argue in 2.b that by advancing previous models we can address timing and network structure. Moreover, research in this line provided no reliable tests of hypothesized dynamics, because it fails to use longitudinal data. Finally, despite ample empirical evidence that cultural dynamics are driven by both positive influence (assimilation) and negative influence (rejection), researchers have mainly focused on the positive side and not integrated both mechanisms theoretically. As a consequence, their models overlook conditions under which contacts may be detrimental for cohesion. We will use insights from recent research on intercultural friendship networks to improve formal social differentiation studies in these respects. First, we use recently developed methods (Sn03;SB03;QC03;VDu03;Sn01) and data (QC03;Mo01) that allow to disentangle empirically the interrelated micromechanisms that according to social differentiation models underly individual norms and social relationships. Second, we incorporate into formal models of social differentiation the theoretical insight from school research that both positive and negative effects of contacts may underly segregation of friendship networks (QC03;BS94). At the same time, we aim to advance research on intercultural friendship formation. Hitherto this research fails to use its empirical insights on microlevel processes for predictions of dynamics and conditions of group cohesion. We use our computational models to derive and test on available school data such predictions, notably about effects of the timing and network structure of contacts.

Finally, we integrate into our research an important insight from studies of subgroup formation in work teams. It has been overlooked by the other research lines that highly correlated dimensions of demographic diversity (like for example in a team consisting of two young female western europeans and two elderly moroccan men) may cause “faultlines” (LM98) that are detrimental for group cohesion. However, hitherto faultline research focuses empirically on the distribution of demographic attributes, such as gender or ethnicity. As a consequence, division lines may be overlooked that are unrelated to demographic differences (like in an interdepartmental project team that is demographically homogenous but divided by differences in opinions between team members). We believe we can considerably advance the analysis of faultline dynamics by our formal explication and empirical analysis of underlying micro processes, based on experiments, school data and data from work settings (see 2.b).

To summarize, the proposed research addresses effects of contact between diverse people on group cohesion. We aim to derive and test previously unrecognized conditions that shape the effect of contacts on cohesion, notably the timing and the network structure of contacts. For this, we develop a formal model that integrates micromechanisms identified in hitherto widely unrelated research lines. Predictions will be tested in group discussion experiments and in the empirical realms of intercultural friendships in schools and diverse work teams.

2b. Approach

Theoretical approach / theoretical subproject

Our starting point is a conceptualization of cohesion that is suitable for diverse groups. We adapt a recent suggestion by Moody and White (2003), and assess group cohesion via the minimum number of members that are needed to hold a group together, i.e. that would need to be removed from a network to split the group in subgroups between which there are not positive social relations or no normative commonalities (cf. MW03 for a graph theoretical elaboration). This implies in particular that in a cohesive group not all group members need to like each other or agree with each other on everything. For example, when A agrees with B on fashion and B with C on music, then the group can still be normatively cohesive even without agreement between A and C. Similarly, a group is structurally cohesive to the extent that every two members are connected at least indirectly through chains of good social relations, e.g. friends of friends of friends. A group is cohesive to the extent that it is both normatively and structurally cohesive.
All three research lines address effects of contacts on cohesion, despite different frameworks. In formal theories of social differentiation contacts affect the similarity of “symbols” (Mar98a;Car91), “cultural forms” (Mar03;Mar98b) or “culture” (Ax97), including social norms. Studies of intercultural friendship formation focus on the degree to which friendship choices connect culturally different subgroups. Finally, research on team diversity explains effects of demographic diversity on team performance partly through effects on team cohesion (GV03;EM00;JNN99). Some studies directly test effects on interpersonal attraction and cohesion (cf. WO98).

How then do contacts between people affect mutual attraction and similarity of norms? Despite diverse perspectives, answers within the three research lines point to four fundamental micro-level mechanisms, homophily, social influence, rejection and heterophobia. We take these mechanisms as the basis of our analysis. While other combinations of microlevel mechanisms have also been proposed to model interpersonal contacts (Pet98), we argue in the following that these four mechanisms correspond well to dynamics observed in a variety of different empirical realms.

**Homophily** is attraction towards similar others, or “birds of a feather flock together” (MSC01; MS87;Byr71;Ne63). In most groups, interpersonal similarity depends on multiple topics and demographic characteristics simultaneously. Accordingly, we model attraction as resultant of the overall similarity between interactants across a range of individual attributes (cf. Mar98a;Ax97). Demographic characteristics are modelled as stable, but individual norms may change. Most social differentiation models derive homophily from a symbolic interactionist perspective (Mar98a,b;Car91,Car86). People who interpret ‘symbols’ similarly also communicate better and thus come to share more common interpretations. Studies of intercultural friendships sometimes attribute homophily to need for social support from same-ethnicity friends (Tat99), or simply refer to ample evidence for homophilious friendship choices (Mo01). Students of team diversity draw on social identity theory (Taj82;TT86) and self-categorization theory (Tur87). They argue that people who are similar in salient characteristics see each other in the same positively evaluated social category, which in turn fosters mutual attraction (GV03;EM01;Veg98).

The mirror image of homophily is **heterophobia**, negative evaluation of dissimilar others. These two mechanisms are fundamentally different. Under homophily, dissimilarity does not entail antipathy, it only implies less attraction. However, with both heterophobia and homophily, attraction may turn into antipathy when dissimilarity becomes too large. Social differentiation models recognize heterophobia (Mar03), but do not combine it with homophily. In research on friendship networks, heterophobia is seen as consequence of perceived threats from outgroups that entail avoidance of outgroup friendships (QC03;Mo01;BS94). In studies on team diversity, heterophobia, like homophily, is derived from social identity and social categorization processes. For example, Earley and Mosakovski (2003) argue that similarities are “contrast[ed] with the perceived dissimilarity of outsiders to enhance self-construals and worth” (28).

**Social influence** is the tendency to adopt norms of attractive others (MF93;Frd84;EZ68;FSB50). **Rejection** is the opposite, the tendency to change individual norms such that one differs more from negatively evaluated others (ML72;Ber66). Researchers mostly derive social influence and rejection from the same theories than homphily and heterophobia. Social differentiation studies and friendship research suggest in addition that rejection may result from actors’ desire to affirm their social identity under perceived threat from outgroups, referred to as “cultural rejection” (Mar03) or “profiling” (BS94), respectively.

This evidence suggests that an adequate theory of the effects of contacts on cohesion needs to incorporate all four micro-level mechanisms. However, in diverse groups the corresponding dynamics may occur between all group members simultaneously within the patterns of given contact possibilities. To grapple with this theoretical complexity, we use agent-based computational modelling (MW02;FM96;MF95) and advance previous models of social differentiation (Mar03;98a,98b;Ax97;SzZ96;Zeg95;Car91) for our purposes. Previous modelling work recognized a self-reinforcing feedback loop between homophily and social influence (similarity fosters attraction, attraction fosters similarity), but neglected the corresponding dynamic implied by heterophobia and rejection (dissimilarity leads to heterophobia, heterophobia increases dissimilarity). We follow instead recent work of Flache and Macy (2004) and Macy, Kitts, Flache and Benard (2003) who combined all four mechanisms. In contrast with previous work, they found that contacts between initially diverse people may undermine social cohesion. Initially diverse but moderately cohesive groups may tend to fall apart in polarized
subgroups that negatively evaluate each other and are opposed on a number of normative issues. The reason is that with all mechanisms operating simultaneously, increasing convergence in norms between some subgroups due to homophily, social influence and small initial similarities may develop alongside with increasing differences and disliking towards other groups – due to heterophobia, rejection and small initial dissimilarities (FM04;MKF03).

This modelling work (FM04;MKF03) suggests that the effect of contacts on cohesion may decisively depend upon the extent to which individuals’ relational and normative choices exhibit heterophobia and rejection. Moreover, these mechanisms may interact with timing and network structure of contact opportunities. In contact opportunities, such as school classes or work teams, people are exposed to each other and need to interact to some extent, so that they learn others’ demographic characteristics and norms. The timing of contacts defines the point in time and the sequence in which particular group members come into contact. The network structure of contacts shapes who has contact with whom (WF94). In the proposed research we apply formal techniques (see further below) to derive specific hypotheses about effects of timing and network structure of contacts. We give here illustrative hypotheses and underlying intuitions based on our theoretical approach. The first hypothesis follows directly from our recent work (FM04;MKF03) and relates the mix of mechanisms at the microlevel to effects of contacts on group cohesion.

**Hypothesis 1**: The more heterophobia and rejection individuals’ relational choices and norm choices exhibit, the more will increased contact opportunities tend to reduce rather than foster social cohesion in initially diverse groups.

For the next hypothesis we extend Lau and Murnighan’s analysis (1998) of demographic “faultlines”. We argue that demographic faultlines are only detrimental to the extent that heterophobia and rejection translate them into emergent normative and relational divisions. We use as operationalization of faultlines the concept of “subgroup strength” (GV03), which indicates the extent to which a group is separated in subgroups with demographic differences on multiple dimensions (cf. Sha04;TJZ03).

**Hypothesis 2**: The more heterophobia and rejection individuals’ relational choices and norm choices exhibit, and the higher the subgroup strength of the demographic distribution of individual characteristics, the more will increased contact opportunities tend to reduce social cohesion and foster group polarization in norms.

Our theory also suggests effects of the timing of contacts: when a diverse set of people is brought into contact immediately, then a tendency towards polarization may arise and split the group. However, when initially only small relatively homogenous subsets of members are in contact, then these subgroups may each develop a local consensus, but each on different norms. Particularly in a large highly diverse group, this may imply that this distribution of norms remains stable when subsequently all subgroups are brought into contact. The reason is that there are sufficiently many subgroups so that most normative positions are represented by some subgroup. When this happens, members may stick to their specific positions, because for every normative issue multiple pressures from social influence and rejection outweigh each other. This balance in turn preserves cohesion despite diversity, because normative as well as relational overlap between subgroups is retained (cf. FM04;MKF03).
Compare two different contact schedules for a large, highly diverse group.

- Schedule 1: relatively homogenous subgroups are formed. Then interaction takes place within these subgroups. Subsequently, all group members are brought into contact with each other and interaction takes place in the group as a whole.
- Schedule 2: All group members are immediately brought into contact with each other and interaction takes place in the group as a whole.

**Hypothesis 3:** In schedule 1, the group will develop a higher level of social cohesion than in schedule 2, cet par. The difference between schedule 1 and schedule 2 will be the larger, the more individuals’ behavior exhibits heterophobia and rejection.

Finally, in a similar vein, we expect that the network structure in combination with the timing of contact opportunities may decisively affect social cohesion. Here follows an illustrative hypothesis.

Compare two sequences of contact networks between homogenous subgroups in a relatively small, diverse group.

- Sequence 1: Every subgroup is first brought into contact with two similar other subgroups. Subsequently, all group members are brought into contact.
- Sequence 2: Every subgroup is first brought into contact with two dissimilar (and also mutually dissimilar) subgroups. Subsequently, all group members are brought into contact.

**Hypothesis 4:** In sequence 1, social cohesion will become lower than in sequence 2. The difference between the sequences will be the larger, the more individuals’ behavior exhibits heterophobia and rejection.

To give an intuition for hypothesis 4, in sequence 1, the similar subgroups tend to converge on a consensus due to homophily and social influence. As a consequence, few different norm profiles remain in the group. Accordingly, it is unlikely that pressures to stay and to change always balance in the second phase. Thus, when all subgroups come into contact some may further converge towards similar norms, due to homophily and social influence. Due to heterophobia and rejection, they tend in the process to distance themselves from initially dissimilar outgroups, which eventually results in lack of normative and relational overlap, thus: low cohesion. In sequence 2, however, it is more likely that each subgroups’ position remains stable in the first phase, due to balanced counterpressures from the two dissimilar other groups. As a consequence, most positions in the opinion space are still occupied when all subgroups come into contact. The overall distribution of norms likely remains diverse and norm profiles overlap, due to a balance of attracting and rejecting pressures from every subgroups’ perspective.

**Methods of theory elaboration**

We begin our analysis with attractor neural networks (ANN) (Hop82;NV97). With ANN’s we model homophily, heterophobia, social influence and rejection as follows. To the extent that two agents $i$ and $j$ have the same demographic characteristics and embrace the same norms at the same time, the social relationship between them will be increasingly positive. Conversely, to the extent that the two agents $i$ and $j$ are different, their relationship becomes increasingly negative. Whether agents evaluate a given level of similarity as positive or negative is depends on an aspiration level. Individual nodes (group members) seek to minimize “energy”, or: dissonance (Fe57), across relations by iteratively adjusting social relations and their individual norms to maintain agreement with “friends” and disagreement with “enemies”. Technically, ANN’s implement this with a Hebbian learning rule (Heb49; cf. FM04;MKF03;KMF99;NV97).

In later stages of theory elaboration, we aim to endogenize theoretically the relative strength of the four micro mechanisms. For this, we model individual decisions explicitly in terms of boundedly rational maximization of social goals (Lin01;Sim82). To briefly illustrate: we expect for example to derive that agents who are more central in the contact network exhibit less heterophobia and rejection, because they have more alternative sources of peer approval from similar others. Technically, we will draw here on previous work of the applicant on adaptive learning models (MF02;FM02), and social control in networks (Fla02;KMF99;Fla96;FM96). Finally, we seek to derive general theorems analytically, based on Markov chain models (You98) and game theoretical analyses of Nash equilibria in network dynamics (Goy03;Jac03;BG00).
Empirical approach
In the first empirical project we choose controlled experiments to test hypotheses with high reliability. The second, subsequent, empirical project addresses field implications for friendship networks in schools and diverse work groups.

In the experimental subproject the dependent variables are measures of normative and structural group cohesion, based on subjects’ choices in repeated rounds of group discussion. Subjects discuss via email simultaneously a number of salient and sufficiently controversial issues selected in pilot studies (cf. Frd99). We use subjects’ initial opinions to manipulate initial group composition (see hypotheses 3 and 4). Via the email access structure we manipulate timing and network structure of contacts. Throughout discussion rounds, subjects record repeatedly their opinions and liking of each other. To control for “cheap talk” we will also explore measurements of liking based on costly rewards or punishments (FG00, Fla96), and we will test effects of subject payment schemes that induce micro level incentives (e.g. rewards for agreement with positively evaluated others to induce homophily). To disentangle in the data analysis the relative strength of the micro-mechanisms and effects of the manipulations, we employ recently developed actor-oriented statistics methods (Sn03, Sn01, Sn96). Hitherto, these methods have only been applied for network change with fixed actor attributes (cf. SB03; Sn01, Sn96). Extensions for changing actor attributes become soon available (Sn03). As a spin-off, our experimental data will help to further develop the statistical technique with a high quality data-set of repeated actor and network change under controlled context conditions.

Field subproject. In a first phase, the field project addresses ethnically and culturally diverse school settings. In a second phase, diverse work teams are addressed.

We aim to use two datasets on friendship formation in ethnically diverse schools for this project. We have access to data from the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative sample of most public and private high schools in the United States. This is a data set of unique size and quality that contains longitudinal data about networks, demographic pupil characteristics and attitudes in a large number of school classes. The other dataset contains repeated measurements of networks and norms in Dutch school classes and is currently collected in the NWO-financed project “The Dynamics of Networks and Behavior” (NWO/ESR Snijders). We plan to use both data sets to test predictions of changes in social cohesion based on observed microlevel mechanisms. Furthermore, hypotheses about network structure and timing of contacts will be tested on basis of information about tracks and classes within schools.

Two data sets are available for work settings. One has been collected on project teams in a one-year research project at a Dutch university. It contains about thirty complete peer evaluation networks and repeated measurements of both demographic and attitudinal individual attributes. The second data set will be newly collected in collaboration with the applicant in a Dutch forensic hospital. Due to reorganization, the frequency of work contacts between members from subdepartments with different organizational subcultures will increase in the course of the study. Consent has been obtained to conduct repeated measurements on a representative sample of organization members, including individual assessment of relational segmentation of the organization and a range of attitudinal and demographic questions. This allows to assess dynamics of structural and normative cohesion. We explore currently how indicators for timing and network structure of contacts between subdepartments can be obtained.

2.c Innovation
We discussed the innovations that we expect from the proposed research in sections 2.a and 2.b. To summarize:
- We derive and test empirically, both in experiments and in the field, hypotheses about effects of the timing and the network structure of contacts on social cohesion in diverse groups. This is a new topic.
- We develop for this purpose a formal analysis that integrates for the first time positive and negative effects of contacts. This highlights potentials for group polarization overlooked by previous models.
- We relate the concept of demographic faultlines (“subgroup strength”) to the distribution of non-demographic attributes, notably norms. We will test both on school data and work group data whether non-demographic faultlines can be used to predict negative effects of contacts on cohesion.
- We test empirically on longitudinal data micro assumptions of formal models of social differentiation, both
in experiments and in field research. We use for this recent advances in actor oriented statistics that have previously not been applied to disentangle micromechanisms empirically.

**2.d Plan of work**

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<th>Experimental (postdoc)</th>
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<td>Dissertation Further publications</td>
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International collaborators:
- Macy, Cornell
- Kitts, Washington State
- Takacs, Budapest
- Moody, Ohio State (Add Health data)

Furthermore, contact will sought with
- Mark, Stanford
- Axelrod, Michigan

**2e. Literature references**


[2f. Utilisation paragraph: Only required for proposals to be submitted to Technical Sciences, see Notes]

Cost estimates

3a. Budget

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Explanations:
- At start of the project in 2005, applicant will hold permanent 1.0 fte assistant professorship at RUG, which will in 7/2006 be upgraded into associate professorship given positive evaluation.
- Accordingly, salary costs of applicant in the budget cover only 25% of his employment, the remaining 75% are paid by the RUG. The 25% included in the budget cover costs of additional research time for applicant, so that in total 0.75fte of the applicant’s work time will be devoted to the proposed research.
- Personal grant to applicant from his faculty (see 3.b) will be used to cover in period 2005-2006 purchase of equipment, applicant’s bench fee, travel costs, subject payment and salaries for support staff.
- From 2007-2009, support staff, bench fee and travel costs of the applicant are included in the budget above.
- For PhD and postdoc, a benchfee of 25% is assumed from which most travel expenses should be covered. For postdoc additional travel budget is planned of 2k€ / year.

3b. Have you requested any additional grants for this project either from NWO or from any other institution? yes/no (If ‘yes’, see Notes)

The faculty of Psychological, Pedagogical and Sociological Sciences of the University of Gronigen provided a personal grant of 80 k€ to the applicant that will be used in the period 2005-2006 to cover the applicants’ bench fee and additional material costs.
### Curriculum vitae

#### 4a. Personal details
- **Title(s), initial(s), first name, surname:** dr. Andreas Flache
- **Male/female:** male
- **Date and place of birth:** 12. 05. 1963, Einbeck, Germany
- **Nationality:** German
- **Native country parents:** Germany

#### 4b. Master's ('Doctoraal')
- **University/College of Higher Education:** University of Koblenz-Landau, Germany
- **Date:** August 1991 (cum laude)
- **Main subject:** A software tool for the empirical analysis of chaotical dynamics

#### 4c. Doctorate
- **University/College of Higher Education:** University of Groningen
- **Date:** 19 December 1996 (cum laude)
- **Supervisor ('Promotor'):** W.B.G. Liebrand (RUG), W. Raub (UU), F.N. Stokman (RUG)
- **Title of thesis:** The double edge of networks. An Analysis of the Effect of Informal Networks on Cooperation in Social Dilemmas.

#### 4d. Work experience since graduating

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<td>Fixed term.</td>
<td>1.0 fte. Postdoc at the Department for Philosophy, University of Bayreuth, Germany. Research Project: &quot;The dynamics of social-dilemma situations&quot;, financed by the German Science Foundation (DFG).</td>
<td></td>
</tr>
<tr>
<td>7/1999-7/2002</td>
<td>Fixed term.</td>
<td>Research fellow of the Royal Netherlands Academy of Arts and Sciences, postdoc at the ICS, University of Groningen. Research project: &quot;Network embeddedness and group solidarity: when do they come together?&quot;.</td>
<td></td>
</tr>
<tr>
<td>7/2002-present</td>
<td>Fixed term.</td>
<td>Senior research fellow of the Royal Netherlands Academy of Arts and Sciences, postdoc at the ICS, University of Groningen. Prolongation of project granted in 7/2002 until 7/2004: &quot;Network embeddedness and group solidarity at work&quot;.</td>
<td></td>
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</tbody>
</table>

Since 2000, member of supervision committee of 4 Ph.D. projects in the ICS program.

#### 4e. Man-years of research

5 years, 7 month (based on 0.8 fte research in all academic positions specified under 4.d)

#### 4f. Brief summary of research over last five years

Flache’s previous research was directed at two main topics, 1) adverse effects of social networks on group cooperation, and 2) cooperation based on learning behavior. Beyond that, the applicant has addressed with formal methods and partly in collaboration with moral philosophers (Hegselmann), various theoretical issues in sociology and social philosophy. In particular, Flache studied the consequences of different rationality assumptions on social support (Flache 2001; Flache&Hegselmann 1999a,b,1998), cooperation (Flache,Macy,Raub 2001; Hegselmann&Flache 2001) and instability of group decision making (Flache&Torenvlied, conditionally accepted). In the study of adverse effects of social networks, the applicant further developed the counterintuitive and innovative hypothesis that a dense network of informal relations may undermine cooperation in a group (Flache 1996; Flache&Macy 1996). In subsequent research, hypotheses were elaborated about the conditions under which strong ties may be detrimental for cooperation, notably task-uncertainty

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1 NWO monitors the inflow of new staff into the research field on the basis of criteria set out in the Wet SAMEN (Employment of Minorities (Promotion) Act). Information will be used only for the purpose for which it is provided. For more information about this legislation (in Dutch only), please visit www.wetsamen.nl
(Flache 2002) and bounded rationality (Flache, Macy, Raub 2001). In subsequent empirical work the applicant collaborated with researchers of the NWO-financed project “Solidarity at Work” (Sanders, NWO-9817), to collect data on informal networks and organizational cooperation in a large sample of Dutch employees. First empirical tests tend to support the expected adverse network effects (Flache 2003). Further publications based on these data are in preparation. With respect to cooperation and learning, the applicant generalized in collaboration with Macy (Cornell University) previous studies and showed in a high impact publication (Macy&Flache 2002) that actors’ aspiration level is a decisive condition for cooperation between learning players across a range of different social dilemma situations. In a subsequent study, Flache and Macy (2003) integrated and compared two specifications of reinforcement learning from the sociological and the economics literature, respectively. They identified previously unnoticed differences between these models. Based on his interest in mechanisms of social control in informal networks, the applicant started recently to address in collaboration with Kitts (U Washington), Macy and Benard (Cornell) the question how informal networks and subgroups may evolve in the first place. With the proposed research the applicant aims to move a decisive step further into this new topic on his research agenda, using models and methods developed in previous work.

4g. International activities

Research visits of applicant
1993 Kellogg Graduate School of Management, Northwestern University, Evanston, Illinois. 2 Month. Host: Prof. David Messick.
1994 Department of Sociology, Brandeis University, Waltham, Massachusetts. 3 Month. Host: Prof. M.W. Macy.
1996 CNR, Department of Cognitive Sciences, University of Rome. 1 Month. Host: Prof. R. Conte.
2001 Department of Sociology, Cornell University, Ithaca, N.Y. 3 Month. Host: Prof. M.W. Macy

Research visits of international guests hosted by applicant
2003 Ma. J. Pujol, University of Barcelona, Artificial Intelligence Department. 6 month.
2003 Prof. Macy, Cornell University. 3 month.
2002 Prof. Macy, Cornell University. 0.5 month.

4h. Other academic activities

- Member editorial board Journal of Artificial Societies and Social Simulation since 2001.
- Reviewer for international peer reviewed journals
- Since 2002 in total 4 presentations as invited speaker at international conferences (see details under 5. Publications / other).

4i. Scholarships and prizes

- Research fellowship of the Royal Netherlands Academy of Arts and Sciences 1999-2002, ca. 300 K€.
- Prolongation research fellowship of the Royal Netherlands Academy of Arts and Sciences 2002-2004, ca. 300 K€.
- Personal grant to applicant from strategic personnel fund of the faculty of Psychological, Pedagogical and Sociological Sciences, RUG. 80 K€.
5. Publications:

Impact factors and assessment of overall impact in research field
Where available, ISI 2002 impact factors are indicated.
In terms of impact factors, the most important publications of the applicant are:


International (refereed) journals

1. **Flache, A.**, R. Torenvlied. *Conditionally accepted*. When do they ever make up their mind? The social structure of instability in decision making dynamics. *Journal of Mathematical Sociology*. (ISI 2002 Impact = 0.5)

National (refereed) journals

-Books, or contributions to books


-Other

Selection of invited presentations


Working papers
5. Flache, A., Hegselmann 2000. Abschlussbericht zum DFG Projekt "Dynamik sozialer Dilemma-Situationen" (Research report for the German Science Foundation). University of Bayreuth, Department of Philosophie (350 p, in German).