

# What is BRACCIA and where did it come from?

Aneta Stefanovska interviewed  
by Terhi Nokkala, January 2008

BRACCIA (standing for “Brain, Respiration, And Cardiac Causalities in Anæsthesia”) is a 1.4 M Euro research programme involving research teams in the Czech Republic, Germany, Norway, Slovenia, Switzerland and UK. The aim is to complete the basic research related to understanding nonlinear and complex interactions between the brain waves and cardiovascular oscillations in anæsthesia and awakened states. It is expected to lead to future development of a new kind of monitor for measuring depth of anæsthesia – so that the programme requires biomedical engineers, physicists, computer scientists, information theorists, physiologists and clinical anæsthetists.

But how does a programme like BRACCIA get started? How does such a diverse team of complementary international experts get together in the first place? How do things work in practice?

In her search for answers to this puzzle, Terhi Nokkala (TN) interviewed Aneta Stefanovska (AS), the Coordinator of BRACCIA, on 16 January 2008. The following transcript of their conversation has been slightly abbreviated and edited in the interests of clarity and to suit the format of the written word.

**TN:** So, the interview will address the following seven themes which I’ve sent to you beforehand, basically –

1. The history of the project
2. The structures and role in the project
3. Previous collaboration history
4. Future plans
5. General collaboration rules
6. Knowledge production
7. Learning, internal dynamics and evaluation.

## **1. The history of the project**

**TN:** So as the first question, I’d like you to tell me a little bit about the history of the project, so why did you decide to establish the project, for instance, and who was the initiator of the project and so on.

**AS:** We already discussed some of this over lunch. History is a very interesting thing and one always has to ask where to start. In this case there are, as usual, longer and shorter versions. For background, let me start by saying a few words about my own research. As I mentioned before I have been working in the same field for a long time, and I expect to continue it until I retire.

**TN:** Hmm...

**AS:** Some time ago Professor Marko Robnik asked whether I always look one step ahead in terms of keeping with what is fresh and important in science. I replied that I don’t really need to because I already have a clear picture of what I should do in this life. My vision is a new view on how living systems function. The stress is on function. Living systems are very complex and non-linear and that’s why, to deal with this vision, one has to know a quite a lot of physics, because I am primarily concerned with the physics of living systems. One also has to know a lot about the mathematical techniques appropriate for dealing with non-linear complex systems,

plus of course a lot of physiology and biology, given that this is the system we are studying. So as you can see it looks very broad. But this is then reduced to seeking an understanding of oscillatory processes within the human body, of which there are many. The cardio-vascular system is probably the most important from this point of view because of its global nature, as the life-maintaining system for the body as a whole.

**TN:** Hmm...

**AS:** People like me, interested in the physics of living systems, often seek to understand brain dynamics. I started with the cardio-vascular system because that is what really makes the organism function, while the brain provides necessary information and control. Of course, the brainwaves are essential and lead to cognition, and in fact to everything. What I'm trying to establish is the physics of the cardio-vascular system, seen as a system of coupled oscillators – a model that I proposed during my PhD, actually, which was back in 1992. But we also need to include brainwaves now because there is already quite a lot of evidence that the cardio-vascular oscillations are somehow interacting with the brainwaves. So this is the big picture.

**TN:** Hmm...

**AS:** This big picture cannot be funded easily with any European grant, despite there being many potential applications, some of which will be really really useful. One of these is anaesthesia. For this particular project anaesthesia turned out to be an easy way to define what our research is all about. As I mentioned during our lunch, I submitted an unsuccessful anaesthesia EC proposal once before when I was quite young, a few years after my PhD mainly because I had a very good friend and collaborator Erik Weber Jensen from Denmark. Anaesthesia simplifies the system, so it gives you the chance to study it in a very clear way. Unfortunately then there was no call that was appropriate for us. So we applied under an information technology call. We failed, I think basically because we didn't belong to this group of people. They didn't recognise us, and our project, as theirs. And it is indeed not information technology: it's more about nonlinear and complex systems. So this was my first attempt. Next, I tried in collaboration with Professor Javorka, from Slovakia. He collected a group from Italy, myself then from Slovenia, a group from Germany, and several other groups from Europe. He asked us all to write packages. Partly because of not being written clearly in fluent English, these packages didn't clearly add up to a coherent picture (even for me!) and the referees evidently felt the same, so that the proposal was not accepted. All this time I had the feeling that, if you want to get EC funding, you have to be lucky: in particular, you need an appropriate call for what you're doing.

**TN:** Hmm...

**AS:** And then it happened. It was while we were in Potsdam at a conference organised by Jürgen Kurths, one of our collaborators. The meeting was on non-linear complex systems, and it included many colleagues and friends from Europe working in the area. Professor Mosekilde from Copenhagen mentioned that there was a call "Tackling Complexity in Science" and we all said "Oh, that's wonderful: finally we have a call for ourselves". But he said "The deadline is 12th of April and that's too soon for me, I cannot make it". It was then 30th of March. Because I had been struggling and waiting for such an opportunity, I took on the challenge, and Peter McClintock and I worked very hard during the next few days. We were also engaged on a very relevant piece of research (published last year in the *Journal of Physiology*). Putting it all together, it was clear that we could promise a strong proposal.

**TN:** Hmm...

**AS:** Our idea was that by measuring the synchronisation between oscillators, here the cardiac and respiratory oscillators, and some of the brainwaves, you can gauge the depth of anaesthesia. This was our main goal, and was already in mind. So it was relatively easy for me and Peter to write the proposal. He mainly dealt with the text while I mainly dealt with workpackages. But we immediately had willingness to collaborate from other relevant groups represented at

the Potsdam conference, and agreement about their roles was easily established. The group in Potsdam is a world-leader in the theory of synchronisation, based on earlier work in the field, especially by Hermann Haken from Stuttgart, with whom I did part of my PhD, and Yoshiki Kuramoto from Kyoto. The Potsdam people wrote a marvellous book about synchronization and have done a lot of work in this area, so it was excellent to have on hand the very people that were creating the theory needed for our project.

**TN:** Hmm...

**AS:** By chance, Martin Hasler from Lausanne was on sabbatical leave in Potsdam at the time, and he joined us. He has been working extensively in the field of non-linear dynamical networks so he's making an excellent contribution especially to the study of brainwave interactions. So that's how Martin came. Milan Paluš from Prague is someone with whom I had already published two papers. He's essential to the project because he creates the numerical methods that are required. He's one of the leading European experts in the field and also a friend. I have been collaborating with Peter, as he mentioned during the lunch, seriously since 2000 although we met for the first time in 1997. So it was obvious that he and his group in Lancaster would join too. I was then at University of Ljubljana, in the Faculty of Electrical Engineering. We also needed clinicians of course. I had enjoyed an excellent collaboration with the group in Oslo since about 1993, involving Knut Kvernebo and Hebe Kvernmo. There are several anaesthetists in this collaboration, Johan Ræder, Per Kvandal, Svein Aslak Landsverk and the research anaesthetist nurse Tomas Drægni – who is now quite essential for the project – so it was very natural to invite them to join us. They are doing clinical recordings because our project is based on analysis of real data, not only theory. In addition, we had already done a preliminary study with Andy Smith and Mike Entwistle from the Royal Lancaster Infirmary, so it was natural to invite them too. In Ljubljana I have been collaborating with Samo Ribarič (Institute of Pathophysiology) for more than 20 years, starting in the era before we did our PhD's. With Fajko Bajrović, the other person there, we had done the preliminary study, on rats, that served as the basis for BRACCIA, so it was again very natural to invite them.

As I already mentioned, we had some problems in submitting this proposal, because after I completed the uploading of the documents for the proposal – 15 seconds before the deadline – I didn't press the "submit" button! But all went well following an appeal and, in the end, the project was approved. That's somehow the history, I think.

**TN:** Thank you. One of the questions that I had here was who took the decision to join the project, whether it was the individual – or the research group, or the department?

**AS:** Oh no, it's always the individuals.

**TN:** It's always individuals?

**AS:** I would say in this sort of enterprise the consortium is bound by a kind of scientific friendship, if you want – involving mutual understanding, mutual interests, complementary expertise, and respect. People joined because they were interested in the topic, because the call was to show that the non-linear dynamics of complex systems can be used to generate something very practical, like a device to measure depth of anaesthesia. At the same time as analysing real data, one has to solve all sorts of questions, thus making several contributions to physics along the way. The questions that come from tackling reality are very, very serious questions and they need to be treated in terms of physics and non-linear dynamics. So the challenge was to develop methods and theories to deal with complex non-linear systems as well as the specific application.

**TN:** And you basically knew all of the partners beforehand?

**AS:** Yes yes, I myself personally knew everybody. I'm not sure that anybody else knew everybody, but I certainly did.

**TN:** So how did you take the decision to invite certain people, and who took the decision to invite others?

**AS:** As I said, most of us were together at the conference in Potsdam: myself, Peter, Jürgen, Misha, Arkady and Martin. And we all said that it's an excellent call and we discussed what we might propose based on our study. The others basically gave us, me and Peter, a green light to prepare the proposal. And so we did so, bringing in people from my existing on-going collaborations. I think it was good idea to stay with a relatively small number of groups, seven, because it's manageable. As Coordinator I find it difficult to imagine how I would manage say 15-20 groups.

**TN:** Hmm...

**AS:** I think this would then become a full-time job, and it would be too much.

**TN:** This is a network of excellence instrument, aren't they...

**AS:** Hmm...

**TN:** ...and networks of excellence are encouraged in the EU guidelines to be rather large, aren't they? Did you consider this factor when deciding to stay rather small?

**AS:** Well, BRACCIA is a NEST, and I think that differs from a network of excellence. But, in any case, yes, I thought it would be more realistic to stay smallish, especially because I knew all these people quite well, so that knew what to expect of them – whereas if I started enlarging I might have ended up having some groups I didn't really know. I'm not particularly born to be a leader because I believe in a kind of guided self-organisation which works if people trust each other very well. But in practice there was no opportunity to consider such niceties, given the submission timescale!

**TN:** Did you take into account in preparing the proposal or selecting the partners, the sort of EU guidelines, how closely did you study, what kind of projects or what kind of forms or so on EU would be looking for?

**AS:** These kinds of things Peter was more familiar with than me because he's more on the institutional side. But it happened fortuitously that we were covering quite a broad number of countries, including much of Europe. At that time I was still in Slovenia, and we had Switzerland, we had Germany, we had Norway, we had Czech Republic and we had UK –

**TN:** Hmm...

**AS:** ...so we met the formal criteria. Yes, I remember we checked this. Because I don't think otherwise we would have got the project.

**TN:** At the same time when you were preparing for this particular project, did you have sort of other projects in the pipeline and if yes, then why did you choose to concentrate on this particular one?

**AS:** As I mentioned before, the main reason was that the call was about complex systems – which was ideal for us. We had a choice between proposing developments in the theoretical or numerical approaches to complex systems, or to go for what we felt to be a very elegant example of how the understanding of non-linear complex systems can be applied usefully to real life. We decided on the latter, and I think it was the optimal choice in all respects.

**TN:** Did you, you already sort of told me that this EU call was perfect for the project but did you think about any other funding sources and, if yes, then why did you decide to go for EU funding? Are there some particularly favourable characteristics within the framework programmes, or something?

**AS:** Indeed, this particular call related exactly to what we were already thinking and doing, so that's why we applied to it. While I was in Slovenia I had some money from the Slovenian

Research Agency for my sort of research. Now here in UK I have applied to EPSRC, but the outcome is still awaited. It's still within the big picture but completely different from BRACCIA. We also have a project financed by Wellcome Trust. So yes, because the picture's big our needs are too – if somebody offered me finances for 5–10 post-docs, I would have no problems in generating excellent research topics for them.

**TN:** How did you choose the work package leaders for the project?

**AS:** Once again, easily and naturally, if you remember how our organisation was self-organised...

**TN:** Yes

**AS:** It was natural for every group to make its own specific contribution and so we decided that a group should lead on the workpackage(s) most optimal for itself. For example Milan (Prague), is managing the work package about numerical methods of data analysis and interpretation of the results of analysis. He's a very excellent, very rigorous physicist (by education) applying ideas and tools of nonlinear dynamics and information theory to real data from complex systems. The people in Potsdam are managing packages about theory, about models, clinicians are managing packages about their clinical work, and so on. So, it was really very natural. That's the best way, I would say, just allowing people to fulfil the role they were doing anyhow.

**TN:** I have another question about the EU regulations but I have a feeling that you have already sort of answered this one...

**AS:** Hmm...

**TN:** ...but if there's anything you'd like to add, is there some EU regulation regarding the framework programme six funding, which was particularly important to you when you were planning or writing the proposal. You emphasised the type of the call to be very important.

**AS:** Yes, very important.

**TN:** But would there be anything else, anything organisational?

**AS:** Well, I suspect that, if you want to have collaborating groups from different countries, the only project umbrella is the EU. Being now just in my second year in the UK, I'm of course learning about the rules here. I am not sure it would be possible to have five or six or seven research groups from five or six or seven countries. Peter is always telling me "Whatever you can justify on scientific/logistical grounds, you can apply for". But for supporting research of this kind, the European Community seems best – and probably the only way.

## **2. The structures and role in the project**

**TN:** Moving on to the structures and roles in the project now. Could you tell me something about the management structures of the project? Do you have a management board or something like that?

**AS:** No we don't have a management board. We try to keep as little as possible administration. We have coordination meetings twice a year, one in the spring and one in the autumn. We meet then, and we discuss progress, problems, and plans. Otherwise we communicate mainly by email. One of my PhD students acts as a very part-time secretary of BRACCIA and helps with coordination and sends round information to everyone.

**TN:** Would you say that your role as a coordinator has somehow evolved or changed...

**AS:** Hmm...

**TN:** ...in the different stages of the process? Or the roles of the other partners, have they changed? For instance from when you first started planning the project proposal, or when you got accepted, or during the course of the actual conduct of the research?

**AS:** Actually my role really did change a lot during the project, not because of the project

itself, but on account of quite extraneous reasons. I was in Ljubljana at the time the project was approved and I had the “luck”, of course in inverted commas – to encounter problems involving interpersonal relations and jealousy between colleagues. It all got quite out of hand, and even the Rector was unable to resolve things. The net result was that I was not allowed to have the project in Ljubljana, and this unfortunately caused considerable complication at the beginning of BRACCIA. In the end, the impasse was resolved by my moving permanently to Lancaster. During the transition, Peter took the project on temporarily as Coordinator and then, once I was stabilised here, I took it back again.

TN: OK

### **3. Previous collaboration history**

TN: Moving on to collaboration history. You already told that you knew all the partners beforehand. Could you tell me a little bit about what type of collaboration was there between you and the other partners, for instance did you have previous EU projects, or, apparently not, though, I understood, or some other research projects or joint teaching, writing papers and so on and so forth?

AS: As I mentioned, I got to know the Norwegian group during a European project. Professor Knut Kvernebo was one partner and I was another: we met in Athens in 1993 and started collaborating in connection with Hebe Kvernmo’s PhD. Subsequently Professor Kvernebo went to Denmark, but I still collaborate with several people from Oslo. I think I must have published at least ten journal papers with them. It has proved a long-lasting, very nice, creative, fruitful, pleasant collaboration involving mutual interests, partly because it’s a clinical group and for me they are doing perfect clinical research. They collect very good quality data to which we can apply all our sophisticated analysis techniques. I think we managed to establish a language of understanding between the Oslo people and ourselves – which is a nontrivial problem given the very different cultures in physics and in clinical medicine – and that’s why the relationship has been so fruitful. It is not easy, but I see myself as a person who is able to translate the two languages in both directions. So, this is the history with Norway.

My connection with Prague probably goes back to around 2000 when I met with Milan and we started collaborating. We had several bilateral projects during the time I was in Ljubljana, and published several joint papers before BRACCIA started.

I have never published a paper with the group in Potsdam, but we meet often at conferences. They’re a really big group and they’re very important, and we have been in very good relationship for many years. Probably I’m closest to Misha Rosenblum whom I have known since 1999.

I have already told you about Martin Hasler.

Peter McClintock had known the people in Potsdam probably as long as me, or even longer. During the early 1990s he helped to develop the theory of stochastic resonance – a phenomenon now appreciated as essential for understanding many dynamical properties of living systems – and with his collaborators in East Lansing, Kiev, Lancaster, Moscow, Pisa, Warwick, and elsewhere, had made seminal contributions to the understanding of the role of noise in general. Just prior to BRACCIA, he and I had been collaborating together with the clinicians here in Lancaster.

And our collaborators from the Institute of Pathophysiology and Jožef Stefan Institute in Ljubljana are also ones that I have known and worked with over many many years. Janko Petrovčič designed and constructed his *Cardio & Brain Signals* signal conditioning unit specially for BRACCIA. Derived from an earlier instrument that I developed myself during my own PhD, it is in use for all BRACCIA data acquisition in Oslo, Lancaster and Ljubljana.

TN: Did you at some point consider other possible partners for the project but for some reason

the partnership failed to materialise?

**AS:** No. But we intend to bring other experts in at the end. As I mentioned before, our BRACCIA organisation involves two coordination meetings per year. The final one is planned for September 2008, in Ljubljana, and we intend it to be an international conference as well as the last coordination meeting. So we will invite some of the experts in the field that are not part of BRACCIA. We already have a contract with Springer for a monograph on the BRACCIA work. We will invite some of the other experts to contribute particular chapters, just to provide a fuller picture.

**TN:** Being a coordinator, do you think that being a coordinator or possibly a work package leader, does it matter for your future collaboration opportunities, or something like that, or for applying for funding in the future?

**AS:** Well, I don't know whether I will get a future project funded more easily than other people because of having been a coordinator. I don't think so. The important criteria are obviously a good proposal, a good consortium, and a measure of luck. We can obviously draw on the BRACCIA consortium, which is excellent, so in that sense I suppose the BRACCIA experience is an advantage for all its members, not just for me.

#### **4. Future plans**

**TN:** Would you do something differently in the future, for instance in terms of selecting the partners or preparing the proposal or organising the project or something like that if you were to do something similar in the future?

**AS:** Well, I would have liked a bit more administrative assistance – but it's questionable whether one could justify a full-time job. Just thinking. We have an excellent research office here, so this kind of support is perfect. But if I had an intelligent secretary, full-time, I would have been happy. I mean it is what I would have liked, that's for sure. There are a lot of forms to fill and it's a lot of work. Maybe if I had some more support then we might have been more visible outside, than we are. We promised to the European Community to be energetic in presenting and publicising our work. We have done a bit of this (e.g. several radio interviews) but maybe we could have done more if we had somebody to help organise it.

**TN:** Would you like to have a different role in possible collaboration or possible EU projects?

**AS:** It all depends. If it is about developing my own personal visions, I would like to be coordinating things. If it is based on somebody else's initiative, where we might be helping by contributing some of our work, then I wouldn't mind having somebody else coordinating it, that's for sure! I enjoy coordinating because of the scientific aspects. I'm not a person who enjoys coordinating because of the management aspects of coordination.

#### **5. Collaboration rules**

**TN:** Moving on to sort of general collaboration rules. What do you think that the European Commission is paying attention to when selecting projects to fund? What do you think might be the most important issue for them?

**AS:** Well I think a very important issue for the EC is the question of policy priorities. Partially, I feel this reflects Europe's wish to compete with the US, Japan, and globally in the world. The priorities are adjusted according to what is going on globally. Priorities seem to be driven more by administrators and managers than by scientists. But I must admit that I haven't had chance to follow the recent policy of the European Community leading to creation of their research council, the ERC.

**TN:** Hmm...

**AS:** Thus I cannot tell you much because I'm not very familiar. But last year I acted as a

referee and served on a panel. It was still, I think, FP6. While I was in Brussels, there was a very nice presentation about the role of the ERC.

**TN:** Did you pay attention to these kinds of things, did you take them into account when you were forming your consortium or writing the proposal?

**AS:** I don't understand exactly what you have in mind here.

**TN:** Well, I asked first whether EU is paying attention to certain kinds of things when deciding which projects to fund...

**AS:** Hmm...

**TN:** ...and now I'm sort of asking whether you consider these things at the stage of writing the proposal?

**AS:** Oh yes, when we were writing the proposal we read all the instructions, for sure, and tried to fulfil all the requirements from those instructions very carefully. That's for sure. But otherwise the direction of our research is still based on the global vision I mentioned at the beginning.

**TN:** Hmm...

**AS:** Plus continuous interaction with world experts related to this field. BRACCIA is only one form of linkage. I have been attending lots of meetings, discussing science and policy with many people all around the world, and in this way gaining information about on-going events in related fields.

**TN:** Yes

**AS:** For example last year I gave more than ten invited lectures in seven different countries. So this is how we ensure that our project proposal reflects current thinking and recent progress in the field.

**TN:** Did you agree upon some explicit working rules or principles within the consortium when you started the project?

**AS:** We took particular attention in preparing the agreement about how to use the data that would be recorded. I think that was all. Partly because the proposal was written in twelve days, it's particularly simple and clear about what is to be done – and it still remains an excellent guideline to what we're actually doing. Nothing has changed.

**TN:** Your project consists of different types of organisations in addition to universities, you also have hospitals and so on, do you think that cooperation is different with different types of organisations?

**AS:** Of course it is. The Norwegians are not part of the European Community. They are not as accustomed to administration as us, which is good because they don't complicate issues. But sometimes they need more time to realise what is needed so, for me as a coordinator, this means that I sometimes need to spend a little bit more time to explain things. Martin and Jürgen are very experienced, and it's easy to communicate with them, because they have had many many European projects already. And things are organised in different ways. The anaesthetists here in Lancaster are extremely busy, so it's difficult to get them involved to the extent I would like to. But again this is perhaps partly because the Royal Lancaster Infirmary is not yet well established in terms of research, although one of the anaesthetists that is with BRACCIA, Andy Smith, is actually the head of research there. Every group has its own specific features that affect the nature of our cooperation.

## **6. Knowledge production**

**TN:** What kind of plans do you have for dissemination and later use of the knowledge that

you produce. For instance are all of the participants, or all the partners, participating in the dissemination?

**AS:** Yes, we all go around to conferences and present our BRACCIA results. Everyone has his/her own specific contribution, and that's one of the dissemination routes. As I mentioned before, we're going to have a relatively big conference this September in Ljubljana, where we will finally bring everything together, followed by the monograph. Then I was asked by Taylor and Frances to propose initiation of a new journal, *Nonlinear Physiology*. If it really happens, the first few numbers will probably be devoted largely to BRACCIA-related research. There is also the possibility of having a new project, because it is obvious that our approach is indeed very practical, applicable and useful. So we envisage a multi-centre study so that the approach will be tested in several clinical centres. This probably depends on having somebody more clinically-oriented than me to supervise and coordinate it.

**TN:** Will that be a framework programme seven project?

**AS:** Yes.

**TN:** What would you say, in this types of research, who is the primary actor in the project, the individuals or the research groups or partners perhaps, or does it vary from one partner to another?

**TN:** It's always individuals, in my opinion. Institutions act only as support for individuals. In BRACCIA we really have collected, I would say, the best experts in Europe: experts are important. Institutions may provide good, or less good, support – and of course it's essential because experts cannot function alone today. They work within certain research groups, e.g. ours or the one in Potsdam. So after mentioning experts, then I say research groups, and excellent research groups can probably exist only where the surrounding and environment are supportive and function well. So that's the hierarchy of importance I would select: experts, then research groups, then institutions.

**TN:** As a coordinator, do you communicate sort of equally with all the partners or more with some partners than others and do you think there are some factors which might have an effect on the way that you, or the extent that you communicate with partners like for instance the work package structure or language or geographical location or something like that?

**AS:** With email it's not difficult to communicate all over. But you have to ask my colleagues, how do they see me, whether I communicate correctly or not. For example I just today received information that my request for the project to be extended by nine months was accepted, and I immediately forwarded the information equally to all. So no, I don't see myself communicating differently or being deliberately selective – except of course where particular topics need to be pursued.

## **7. Learning and internal dynamics and evaluation**

**TN:** OK. What is your opinion on how the project is going, what are its strengths and problems? I am moving on to the last section, which is the evaluation.

**AS:** Hmm... With the extension I think we will be able to do everything we promised. As I mentioned, our main problem in practice lies in getting enough patients recorded. Animal studies are OK because you can collect animals, you can make measurements on them when you choose. But with humans it's not so easy. First of all, they should be willing...

**TN:** Hmm...

**AS:** ...possibly having a different type of anaesthesia from what they might otherwise have had, and for at least half-an-hour longer in anaesthesia to allow time for the recordings. Seemingly, you need to have a large hospital to have a large enough number of suitable patients. In Lancaster (small) it has gone slowly, so far. In Oslo it seems to be OK because it's a bigger city,

and a bigger hospital. So we will probably collect most of the data in Oslo. But we already have some data collected here in Lancaster, most of the animal experiments are done, the Oslo recordings are going well, and so I think all will be OK.

**TN:** How do you evaluate the way that the project is coming, how do you follow?

**AS:** During the twice-a-year coordination meetings, we explicitly evaluate what has been done, what should be done, and where we are. We usually revise work-packages where necessary. And apart from the delay in the programme (caused by the start-up problem I mentioned) I think everything's OK. Now that the unpaid extension has been agreed, all will be finished in time.

**TN:** Do you think that the European Union is evaluating your project in some way, and if yes then what do you think about it?

**AS:** Well, yes, indeed we have submitted one report already, after 18 months. We had a few problems with it, but they were not with the science but, rather, financial and administrative technicalities.

**TN:** Hmm...

**AS:** Maybe I am not explaining properly. Our officer in the University Research Office explains financial parts to other people. For example when I had to prepare the half-term report it took a few more months because a lot of data had to be derived and filled in on forms. This is not a particular talent of mine! So the process took longer than probably the European community expected.

**TN:** In general – I'm conscious that you are running out of time – but in general, which issues do you see, you perceive as promoting collaboration or impeding collaboration, especially in an international setting?

**AS:** I didn't catch again, what's the point in promoting collaboration?

**TN:** In general, what types of issues have an effect on either promoting or impeding collaboration especially in an international setting?

**AS:** Hmm, how do we group ourselves, you want to say? Inevitably you start to liaise with people that are doing similar work, who have common interests. That's the way I collaborate. I go to a conference for example, I listen to a good talk, or I find out that somebody has done something relevant for us. And then somehow collaboration emerges. Or I give a talk, and people come to me after it, and another collaboration emerges. That's usually how we initiate collaborations.

**TN:** Is there anything that you would like to see changed in the future framework programmes?

**AS:** What I want to see – a reduction in administrative formality and paperwork – probably will not happen. I'm struggling with the administrative side of the story at present, but to some extent this is obviously necessary because the European Community needs to have instruments to control how things are done and so on and so on.

**TN:** That was all the questions I had prepared, but if there's anything that you would like to add, or anything that I might have overlooked and should have asked?

**AS:** When you will send it to me I will think about this, because right now I feel that I had better go to my meeting.

**TN:** OK.

**AS:** Thank you very much for taking your time and I hope this was useful.

**TN:** This was very useful, thank you. Thank you for the interview again.