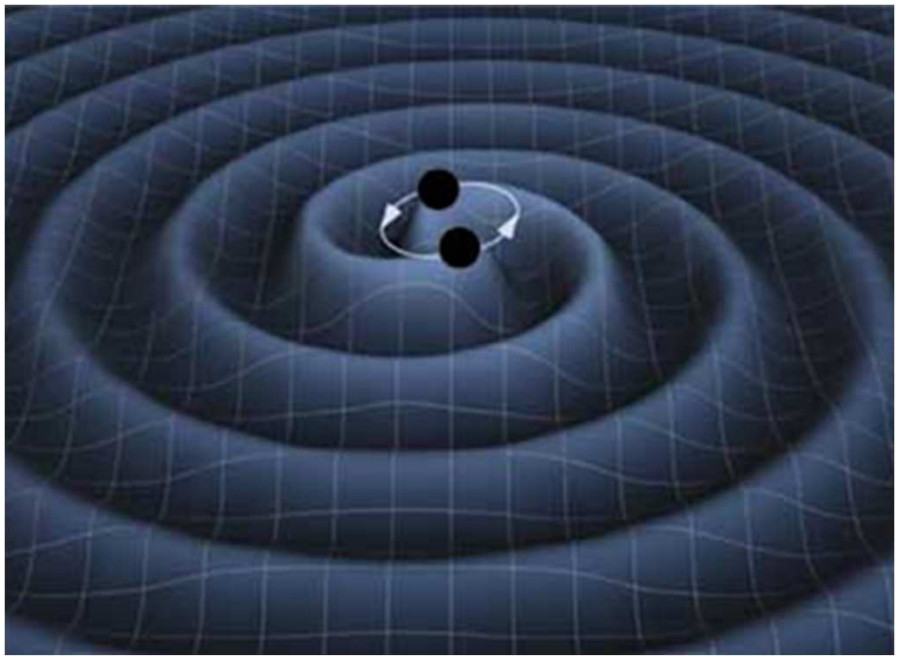
EUROGRAV 1986–1989
The first attempts for a European Interferometric Gravitational Wave Observatory

Adele La Rana
University of Verona & INFN Rome 1
Italian Society for History of Physics and Astronomy (SISFA)

Swedish Academy Physics Class visit
Pisa June 15-17, 2022

Edoardo Amaldi (1908-1989)

Changing landscape of coincident analysis



A large number of coalescing binary systems have been observed so far by the three detectors LIGO and Virgo, allowing an accurate and reliable modeling of these kinds of signals.

This deeply affected data analysis and sources detectability, so that at present the single-detector observations are given credence.

This is not the case for new still-undetected kinds of transient signals (supernovae, for example).

This was not the case before the first detections…

Long-Baseline Interferometric Detectors
Advanced LIGO and Advanced Virgo

Why is there **in Europe only one long-based interferometer** for GW detection instead of two, as in USA?

Can we learn something from the history of European GW research that can help the present European collaborations in order to plan the future 3rd Generation (**3G**) interfometers, as Einstein Telescope?

First generations of detectors

1G Resonant Bars

2G Cryogenic Bars

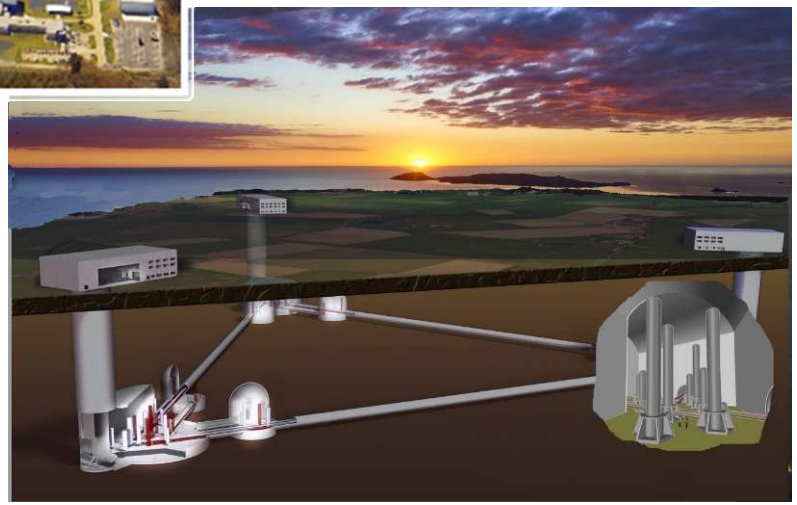
3G Interferometric Antennas

A change of scale in GW research

Generations of long-based interferometric detectors

1G LIGO and Virgo

2G Advanced LIGO,
Advanced Virgo



3G Einstein Telescope

Einstein Telescope Scientific Collaboration

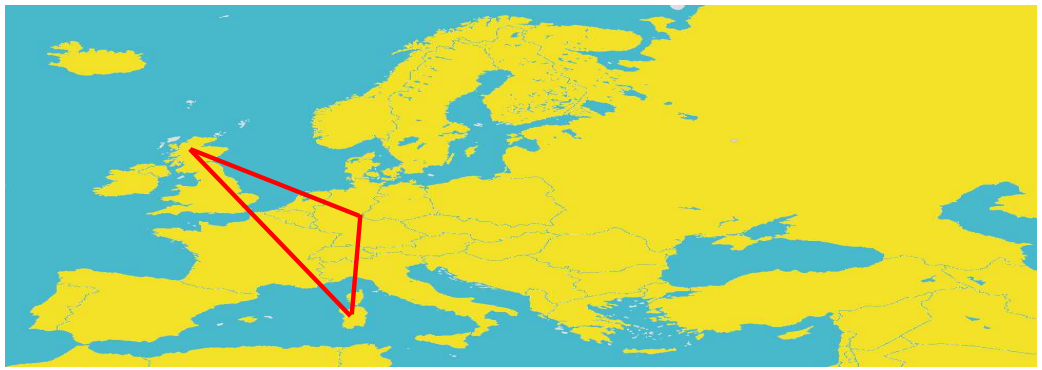
Budapest 7-8 June 2022
The ET Scientific Collaboration is born

MARCH 1988

Report of an ad-hoc Working group on the future of Interferometric Wave Antennas in Europe

"The European groups […] agreed to form a collaboration, **EUROGRAV**.

All members of the collaboration will work towards establishing the best possible European network, with the aim of establishing a gravitational astronomy."



Membership of Working group:

Alain Brillet CNRS – Univ. Pierre et Marie Curie, Paris

Ian Corbett Rutherford Appleton Laboratory

Adalberto Giazotto INFN section of Pisa and Univ. of Pisa

Jim Hough Univ. of Glasgow

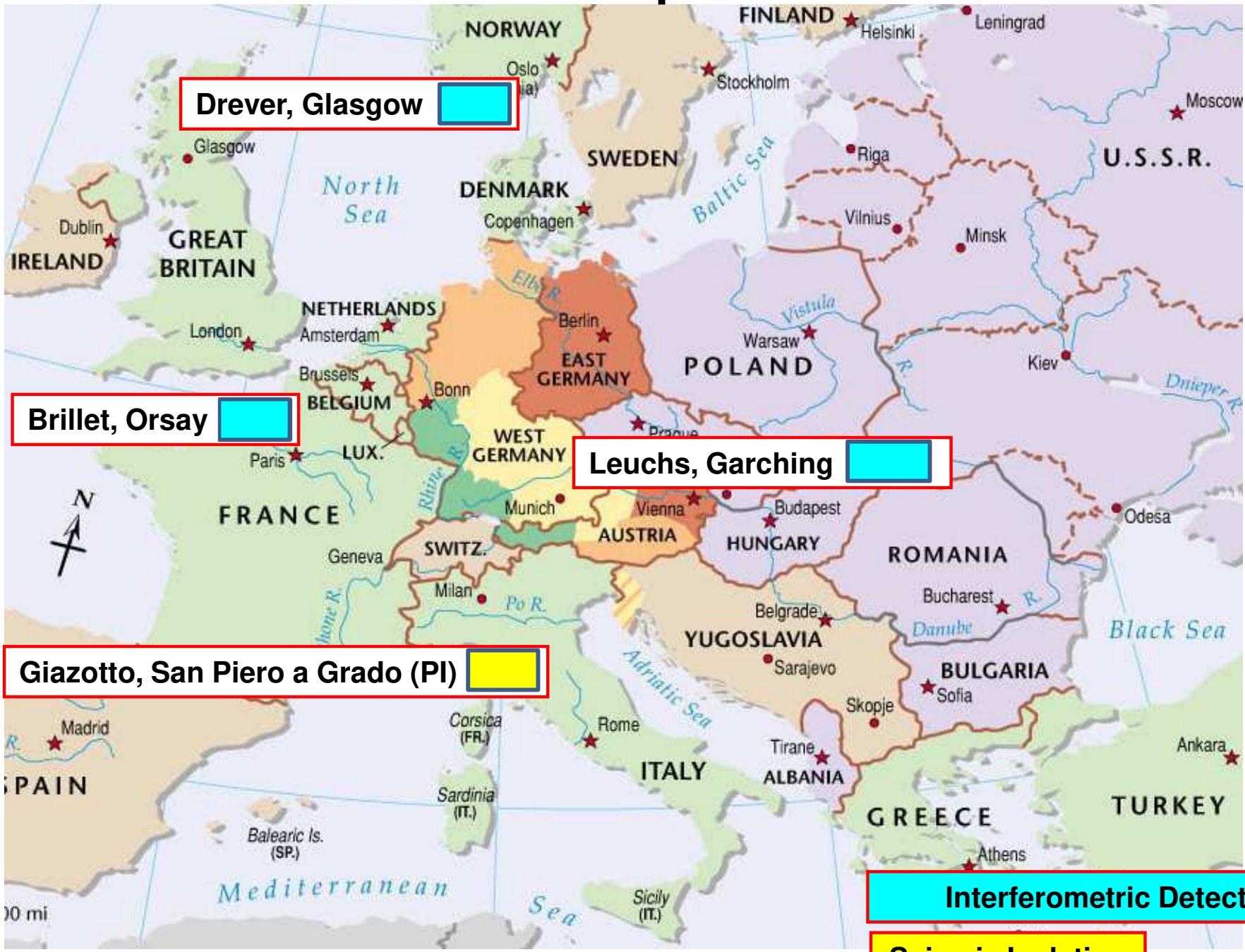
Gerd Leuchs MPI fur Quantenoptik, Garching

Bernard Schutz Univ. College, Cardiff

Philippe Tourrenc CNRS - Univ. Pierre et Marie Curie, Paris

Walter Winkler MPI fur Quantenoptik, Garching

1980s: a picture of interferometric GW research in Europe



Report of an Ad-Hoc Working Group on the Future of Interferometric Gravitational Wave Antennas in Europe.

March 1988

Membership of Working Group:

A Brillet CNRS - Univ. Pierre et Marie Curie, Paris

I F Corbett Rutherford Appleton Laboratory

A Giazotto INFN sezione di Pisa e Univ. di Pisa

J Hough University of Glasgow

G Leuchs Max-Planck-Institut fur Quantenoptik, Garching

B F Schutz University College, Cardiff

Ph Tourrenc CNRS - Univ. Pierre et Marie Curie, Paris

W Winkler Max-Planck-Institut fur Quantenoptik, Garching

SUMMARY

This report examines the scientific case for constructing interferometric gravitational wave antennas, and argues that a network of detectors is required if complete astrophysical observations are to be possible. For Europe this need is best satisfied by the construction of three independent, but networked, interferometers. For each instrument, the limiting background signal spectral density should be significantly better than 3.10-23/Hz (corresponding to a strain sensitivity of better than 10-21 for a 1 kHz bandwidth), over a frequency range extending from a few kilohertz down to tens of hertz, if possible. Such a sensitivity over a wide bandwidth could result in the annual observation of several hundred events of various origins.

Although the detailed scientific priorities and strategies that have been selected are different, the proposals presented to their respective funding bodies by UK, German and Italian-French groups already incorporate these goals, and the working group has established a framework for active collaboration between these groups. This is now operational, and five specialist groups have been formed to work on different aspects of the design of long-baseline interferometers. The aim is to find cost-effective solutions to the many common design problems whilst retaining the independence and flexibility necessary to respond to different funding scenarios.

Collaboration in the construction of detectors would probably best be done through conventional bi-lateral agreements.

2.BACKGROUND

All the European groups working on the interferometric detection of gravitational radiation have been collaborating successfully for several years. Early in 1987 it became clear that the rate of progress and the performance levels actually achieved were such that the groups should put forward a coherent plan for the joint development and realisation of a

Report of March 1988: EUROGRAV is born

An array of three detectors in Europe would give the European groups the minimum independence necessary to enable Europe to maintain its leading position in the field.

Technically and scientifically the European groups have the capability to construct and operate a network that could make the first detection of gravitational waves and that could reach the critical number of three antennas that would see the birth of gravitational wave astronomy.

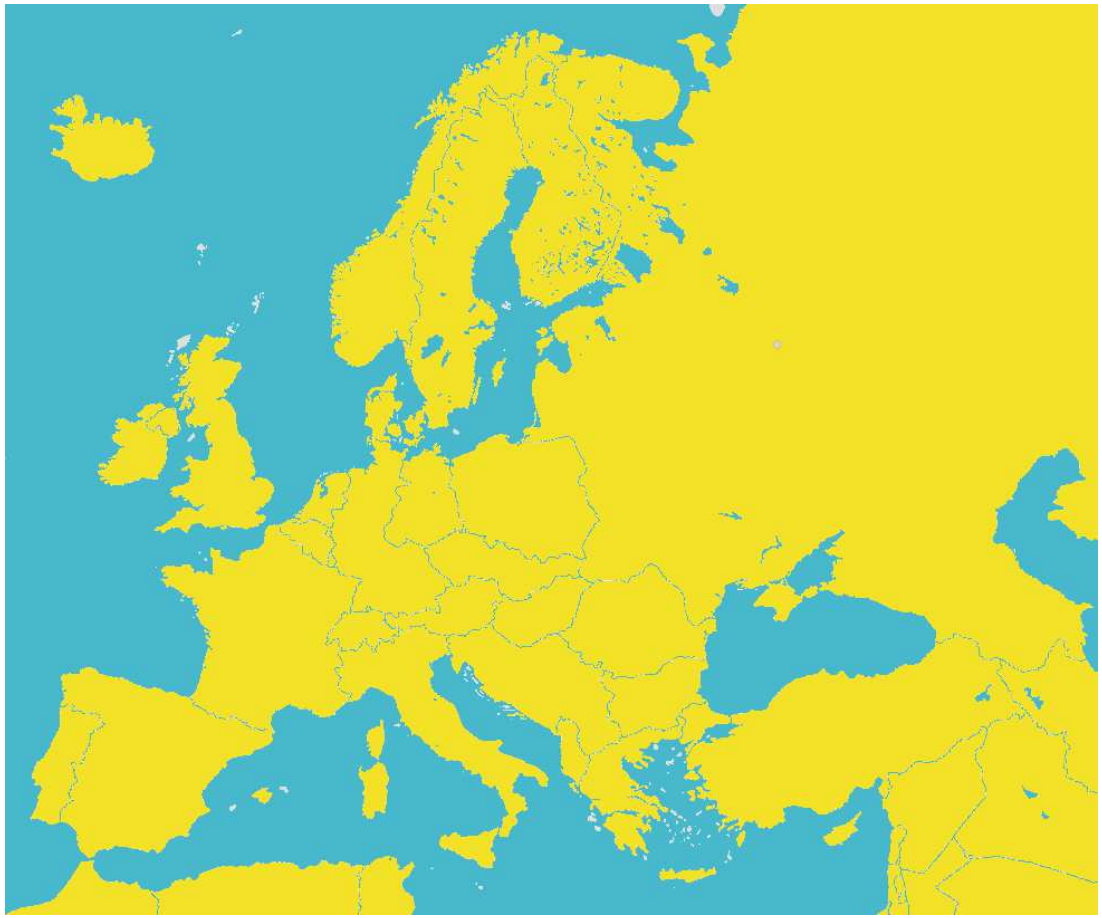
Three European detectors operating with an American array, built either simultaneously or subsequently, would become one of the most important astronomical instruments of the modern age.

Report on the future of Interferometric Wave Antennas in Europe, March 1988

"A network of three antennas has such a large advantage over only two antennas that it must be a reasonable European goal to build three detectors

Such a network would be capable of providing extremely useful scientific information on its own, regardless of what happens in the world."

Report of an ad-hoc Working group on the future of Interferometric Wave Antennas in Europe, March 1988



"The European funding bodies are invited to endorse the formation of a collaborative European programme directed towards construction of a network of detectors, and dicuss how the best objectives of that programme can be realized in order that European science can capitalize on its past investment and present scientific and technological lead."

Report of an ad-hoc Working group on the future of Interferometric Wave Antennas in Europe, March 1988

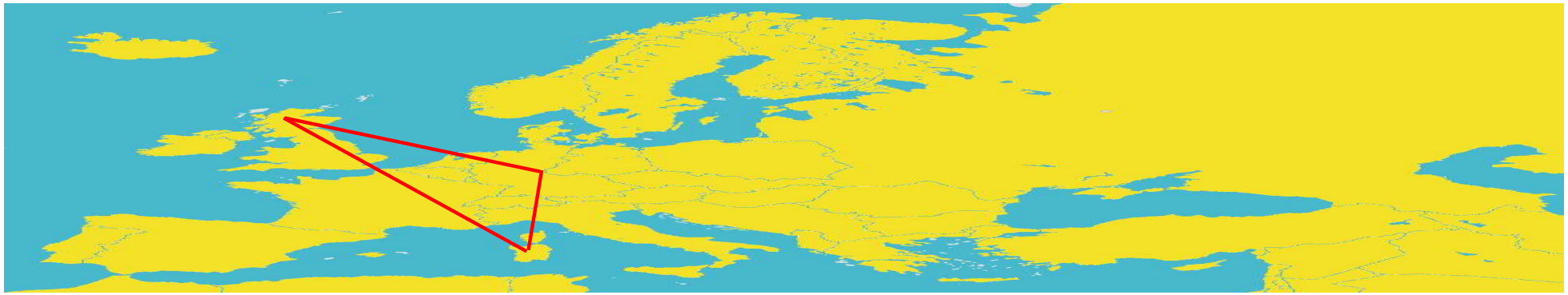
Funding Agencies involved so far:

United Kingdom: SERC (Science and Engineering Research Council)

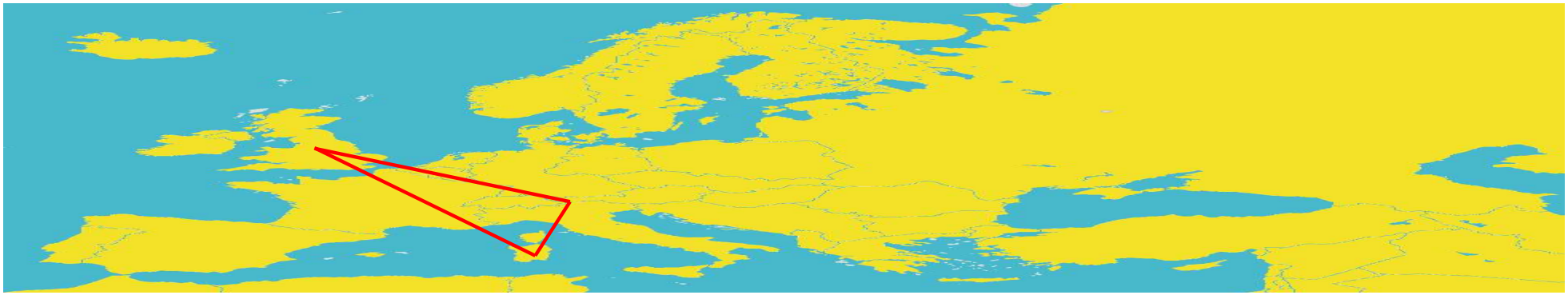
Germany: BMFS (Federal Ministry of Education and Research)

France: CNRS (Centre National de la Recherche Scientifique)

Italy: INFN (Istituto Nazionale di Fisica Nucleare)



So what did go wrong?



London, November 1990

Big history intercepts the small community of gravitational waves

Berlin, November 1989

Big history intercepts the small community of gravitational waves

First-hand data sources and oral testimonies

- **Personal folders of:**

Alain Brillet
Adalberto Giazotto
Marco Napolitano

- Scientific papers and reviews

- **Archives:**

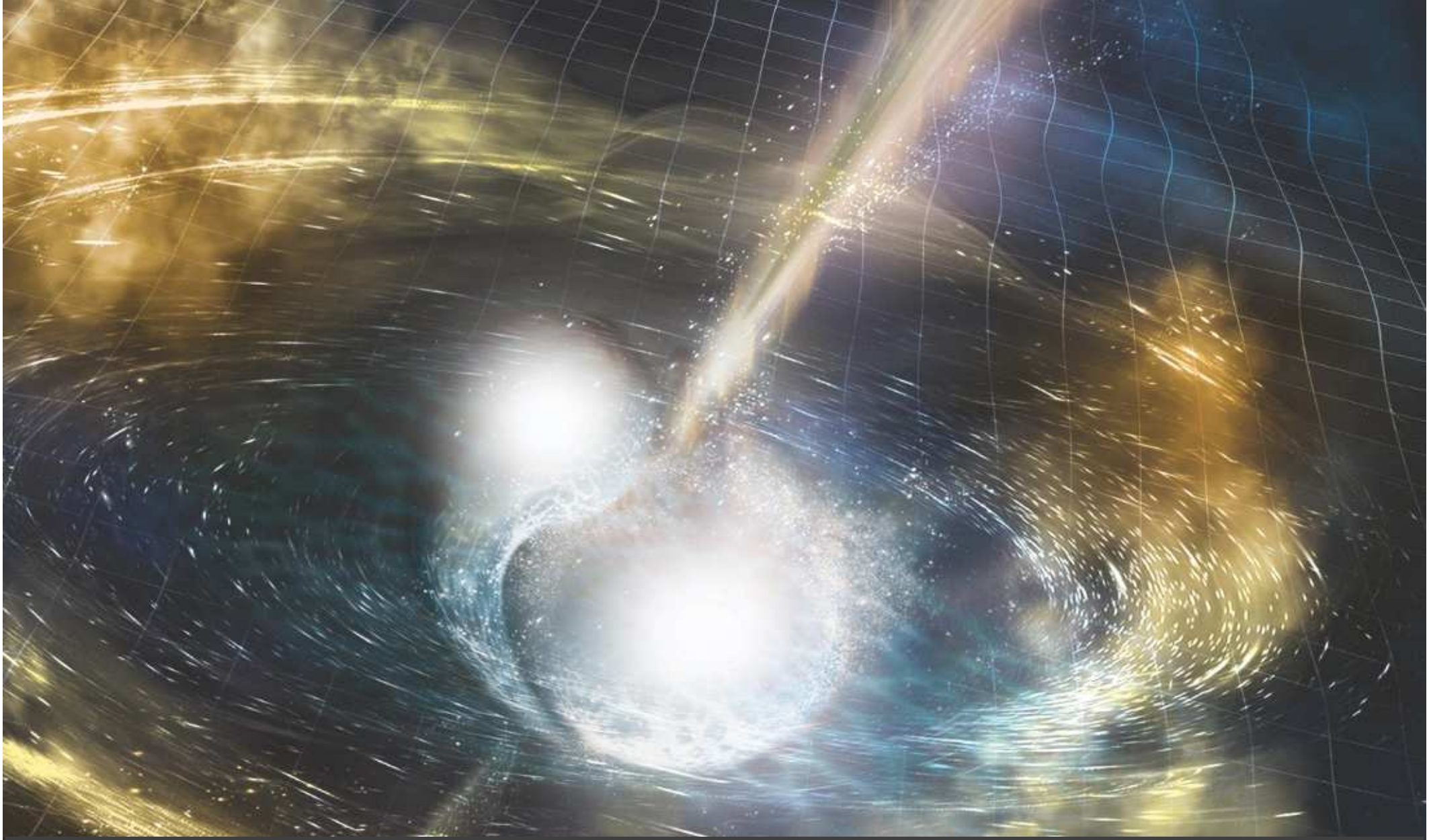
Virgo Archive in Cascina
Edoardo Amaldi Archive in Rome

- **Interviews:**

Barry Barish
Carlo Bradaschia
Alain Brillet
Enrico Calloni
Massimo Cerdonio
Ian Corbett
Karsten Danzmann
Luciano Di Fiore
Angela Di Virgilio
Sergio Frasca
Adalberto Giazotto
Jim Hough
Heinrich Heitman
Gerd Leuchs
Giovanni Lo Surdo
Luciano Maiani
Leopoldo Milano
Ivo Modena
Marco Napolitano
Gian Vittorio Pallottino
Diego Passuello
Guido Pizzella
Fulvio Ricci
Albrecht Rudiger
Herman Schunck
Bernard Schutz
Paolo Strolin
David Shoemaker
Jean Yves Vinet
Stefano Vitale
Walter Winkler

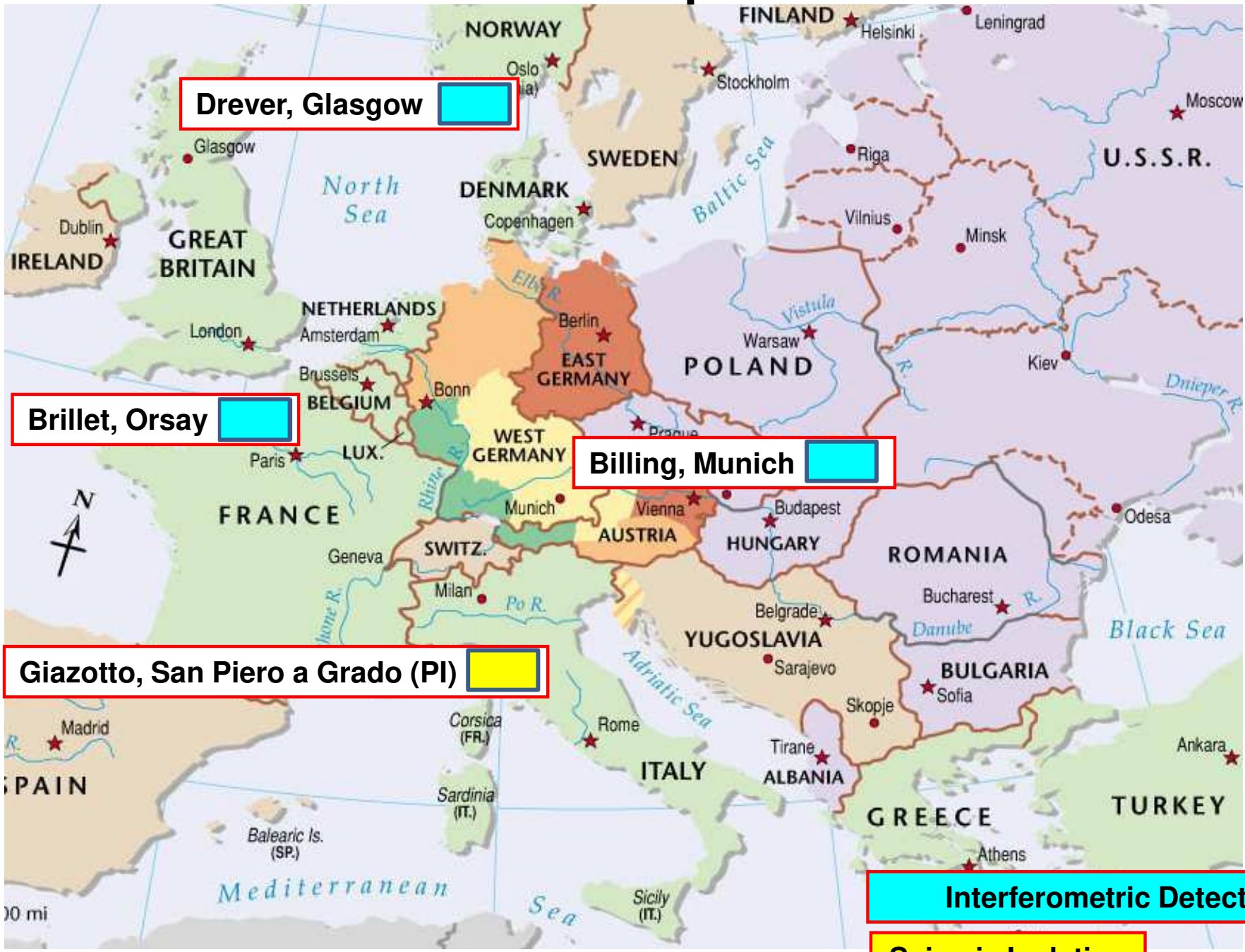
Alain Brillet and **Adalberto Giazotto** (late 90s)

Alain Brillet and me (Virgo, July 2017)

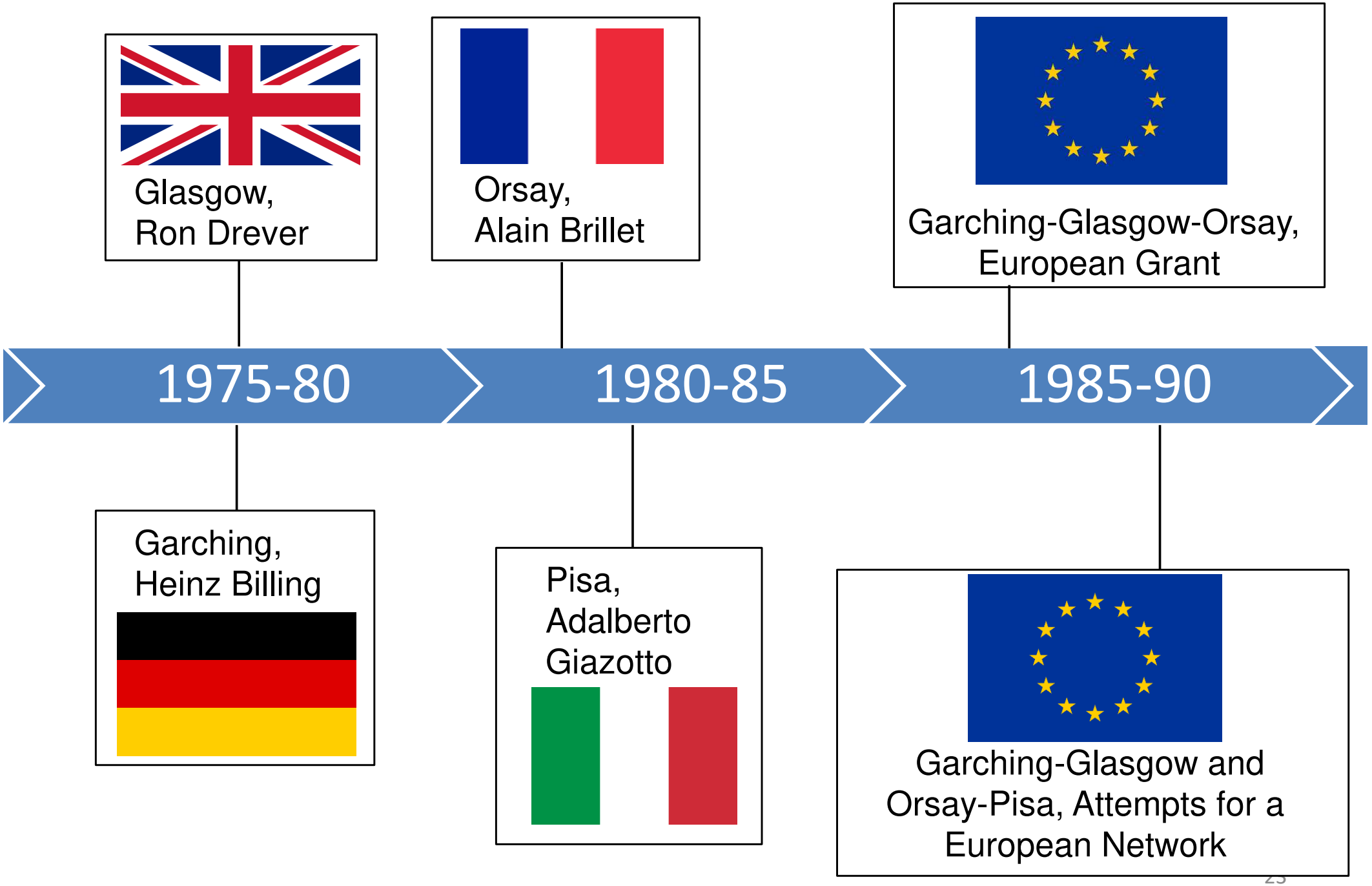


- Scientific disagreements (the problem of prototype)
- The difficult balance between national ambitions and international collaboration
- The difficult transition from bench-top experiments to Big Science
- Absence of a coordinated GW community

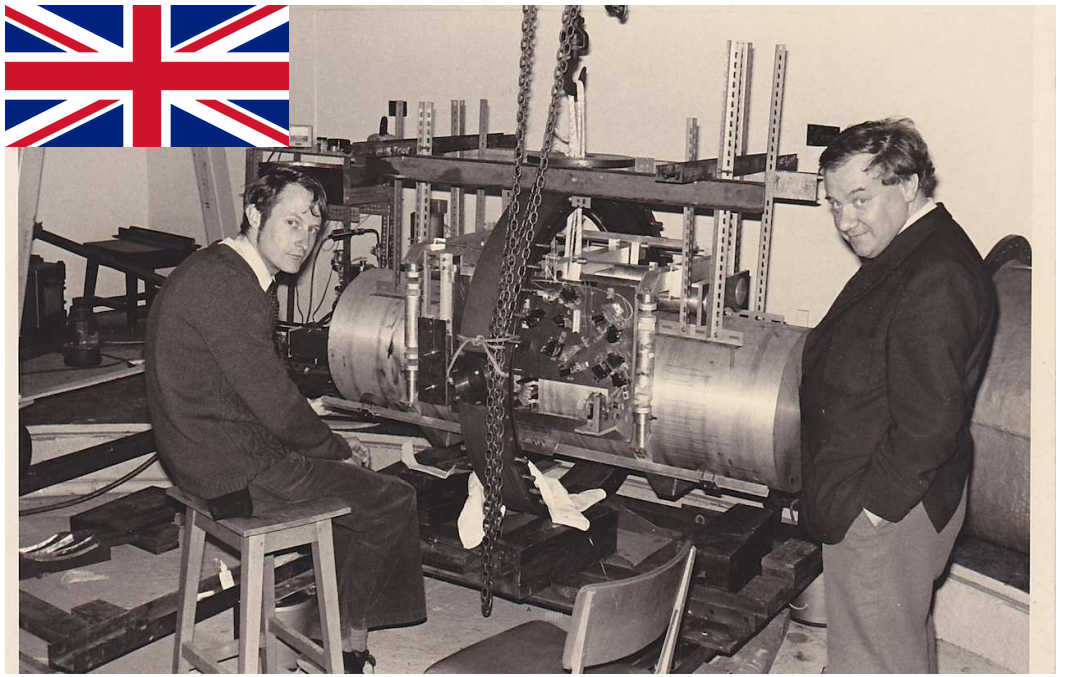
1980-1985: a picture of interferometric GW research in Europe



The Start of Interferometric Detector Research in Europe



Walter Winkler and Karl Maischberger
Garching, 70s



Jim Hough and Ron Drever, Glasgow 1972

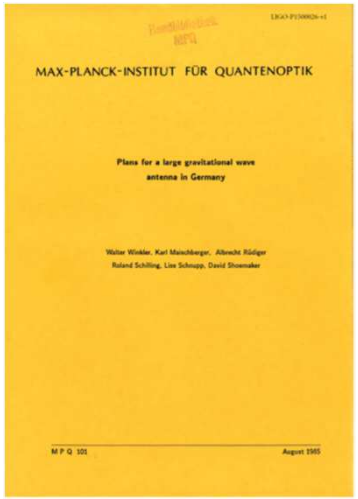
Orsay Group in 1988: Nary Man, Alain Marraud, Alain Brillet, David Shoemaker, Olivier (student), Sorrento

The European «Optical Groups»

National ambitions

1984: J. Hough, S. Hoggan, G. A. Kerr, J. B. Mougan, B. J. Meers, G. P., Newton, N. A. Robertson, H. Ward, R. W. Drever, ***The development of long-baseline gravitational radiation detectors at Glasgow University***
A detailed design prepared with Rutherford Appleton Lab (**Ian Corbett** et al.) and University College – Cardiff (**B. Shutz**), and proposed to **SERC** in **1986**.

1985, German Proposal:


MAX-PLANCK-INSTITUT FÜR QUANTENOPTIK

Plans for a large gravitational wave antenna in Germany

To guard against spurious signals due to local noises sources, verification with at least one further interferometer is required. [...] Collababorations with exp. groups in the other countries is highly desirable.

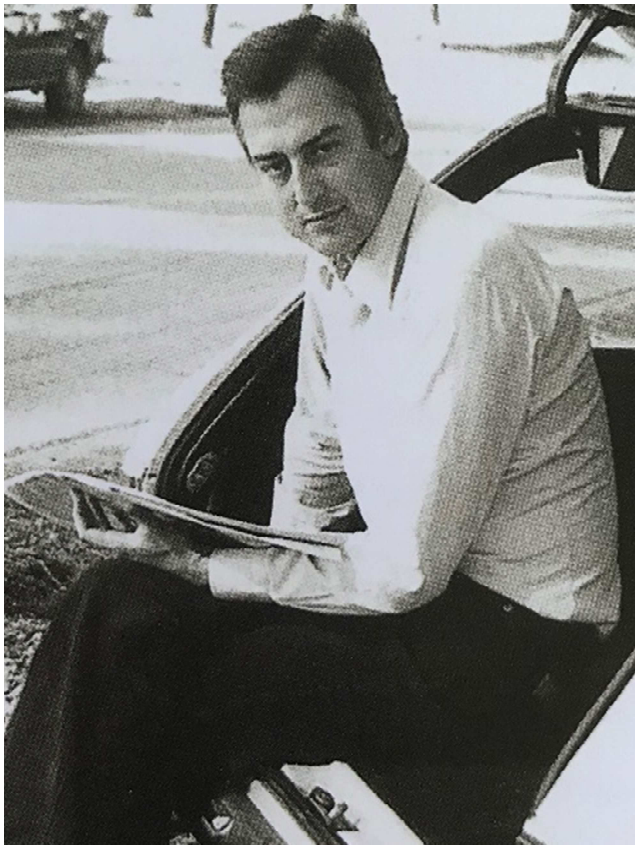
Brillet:
*De **1982 à 1984**, l'Institut National d'Astrophysique et de Géophysique nous consentit l'aide de ses services techniques pour évaluer le coût d'un détecteur kilométrique sur le site de **Nançay**, et y effectuer des mesures de bruit sismique. En France, le projet avait été placé dès 1986 sur la liste des futurs Très Grands Equipments, mais n'avait pas la priorité, précédé dans le domaine des sciences fondamentales par le VLT.*

First step towards a European network

1985: the groups of Glasgow, Garching and Paris make a joint application for a European twinning grant in the EEC stimulation program, under the impulse of Philippe Tourrenc.

First formal action towards a European collaboration for GW research

Towards low frequencies…



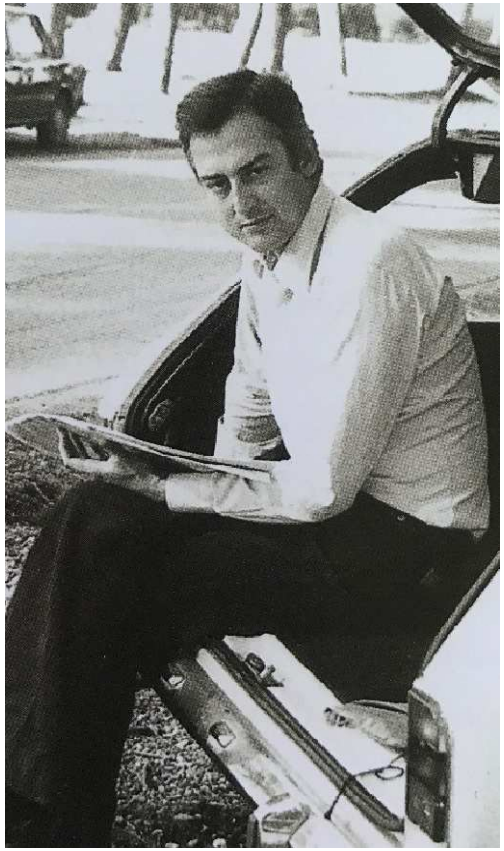
Adalberto Giazotto, 70s

- **1982:** A. **Giazotto**, *Interferometric Detection of Gravitational Waves: Theory and Noises,* Internal report, INFN Pisa
- **1983:** the experimental activity **IRAS starts** in San Piero a Grado (Pisa).
- **1984**: A. Giazotto et al., **Interferometer for the Active Reduction of the Seismic Noise**, Proposal to INFN

Giazotto (interview 2016):

«*At that time results from Australian Radiotelescope led by Dick Manchester were giving very exciting results in the Pulsar detection. We realized that a relatively big number of Pulsar could have frequency > 10 Hz*»

IV Marcel Grossmann Meeting, Rome 1985



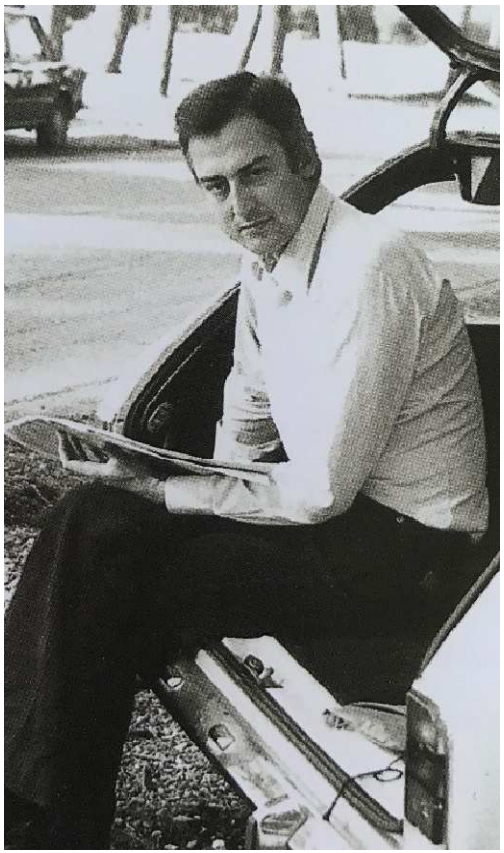
Adalberto Giazotto

Alain Brillet

Giazotto remenbered:

«During a walk with Alain Brillet of the CNRS around the fountain of Minerva in the courtyards of the University Sapienza in Rome, the idea of Virgo started to make his way.”

IV Marcel Grossmann Meeting, Rome 1985



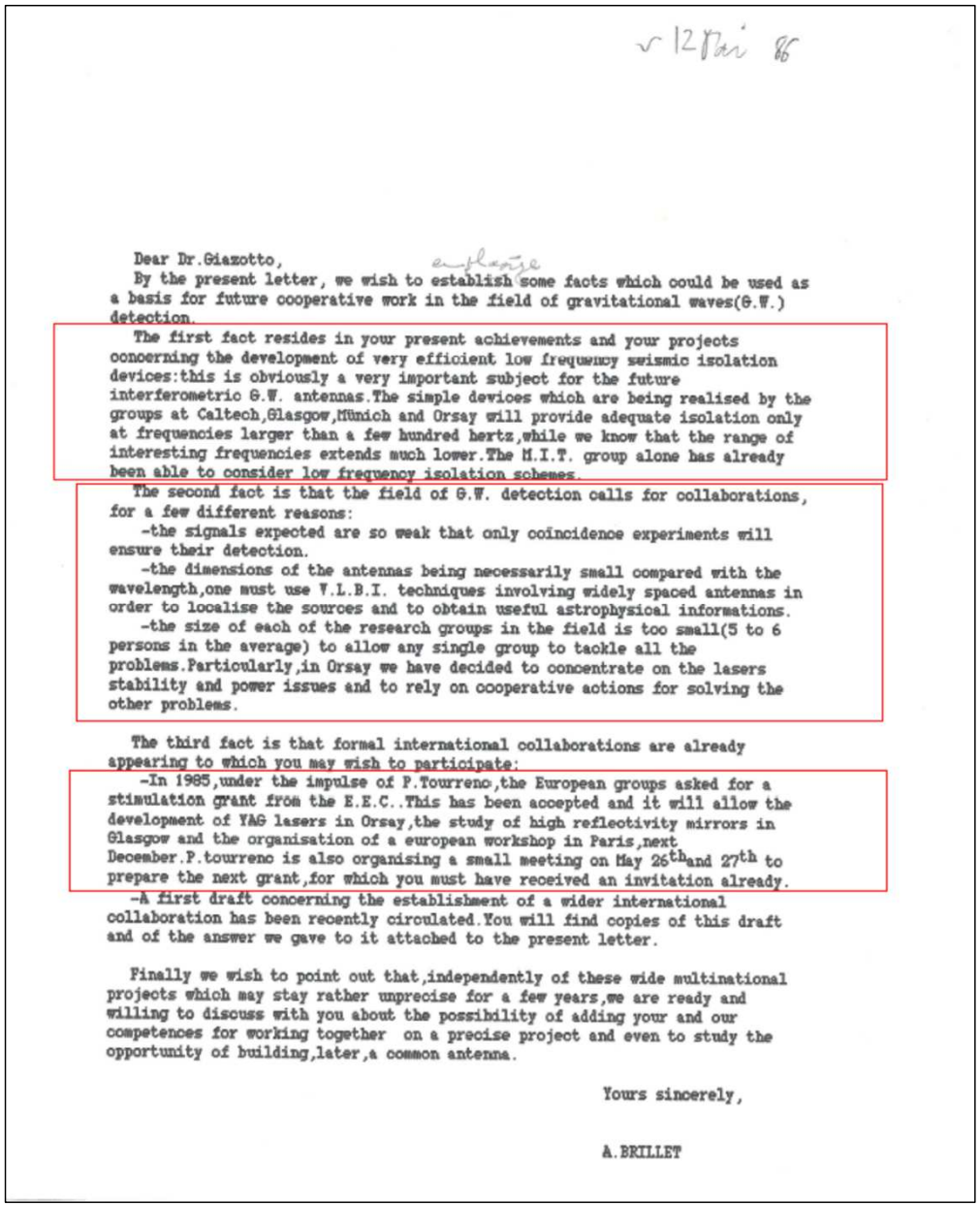
Adalberto Giazotto

Alain Brillet

May 9, 1986 – Letter by Giazotto to Brillet:

"It should be then very nice if our two groups could collaborate together in view of the common scientific interest and of the complementary knowledges.
The hope is that we can in the future realize a large interferometric antenna having good sensitivity at low frequency.

The Pisa-INFN is ready to give due support to a common program presented and approved by the INFN National Scientific Committee"



12 Mai 86

Dear Dr.Giazotto,

By the present letter, we wish to establish some facts which could be used as a basis for future cooperative work in the field of gravitational waves(G.W.) detection.

The first fact resides in your present achievements and your projects concerning the development of very efficient low frequency seismic isolation devices:this is obviously a very important subject for the future interferometric G.W. antennas.The simple devices which are being realised by the groups at Caltech,Glasgow,Münich and Orsay will provide adequate isolation only at frequencies larger than a few hundred hertz,while we know that the range of interesting frequencies extends much lower.The M.I.T. group alone has already been able to consider low frequency isolation schemes.

The second fact is that the field of G.W. detection calls for collaborations, for a few different reasons:

-the signals expected are so weak that only coincidence experiments will ensure their detection.

-the dimensions of the antennas being necessarily small compared with the wavelength,one must use V.L.B.I. techniques involving widely spaced antennas in order to localise the sources and to obtain useful astrophysical informations.

-the size of each of the research groups in the field is too small(5 to 6 persons in the average) to allow any single group to tackle all the problems.Particularly,in Orsay we have decided to concentrate on the lasers stability and power issues and to rely on cooperative actions for solving the other problems.

The third fact is that formal international collaborations are already appearing to which you may wish to participate:

-In 1985,under the impulse of P.Tourreno,the European groups asked for a stimulation grant from the E.E.C..This has been accepted and it will allow the development of YAG lasers in Orsay,the study of high reflectivity mirrors in Glasgow and the organisation of a european workshop in Paris,next December.P.tourreno is also organising a small meeting on May 26th and 27th to prepare the next grant,for which you must have received an invitation already.

-A first draft concerning the establishment of a wider international collaboration has been recently circulated.You will find copies of this draft and of the answer we gave to it attached to the present letter.

Finally we wish to point out that,independently of these wide multinational projects which may stay rather unprecise for a few years,we are ready and willing to discuss with you about the possibility of adding your and our competences for working together on a precise project and even to study the opportunity of building,later,a common antenna.

Yours sincerely,

A.BRILLET

May 12, 1986 – Brillet to Giazotto:

The simple devices which are being realized by the groups at Caltech, Glasgow, Munich and Orsay will provide adequate isolation only at frequencies larger than a few hundred hertz, while we know that the range of interesting frequencies extends much lower.

[…] *formal international collaborations are already appearing, to which you may wish to participate.*

Brillet was referring to European groups, but also to a wider collaboration with scientists from MIT and Caltech (Cardiff meeting in February 1986)

EUROPEAN GRAVITATIONAL WAVE DETECTOR WORKING PARTY

The aim of this Working Party is to produce a report to be submitted to the three funding bodies which have so far been approached: BMFT, CNRS and SERC. Neither the Working Party nor its report will have any official status.

The report should present a unanimous view of a collaborative European approach to the construction and operation of interferometric gravitational wave detectors. It should address and offer solutions to technical problems, provide realistic cost envelopes for a limited range of options, and present and evaluate models for the organisation and management of the collaborative project.

To be effective, the working party must produce arguments which convince the funding agencies not only of the importance and timeliness of the science and the technological feasibility of the project, but also of the ability and determination of the separate groups to work together. Its conclusions and recommendations should provide a negotiating framework for the funding agencies, and form the basis of any approach which might be made to other funding bodies, national or European. Any new groups proposing to join the original collaboration would be expected to accept it as the basic working document.

SOME TOPICS TO BE CONSIDERED

1. Whilst we are convinced that there should be at least two detectors in Europe, what are the cogent scientific arguments to justify this? How many antennae should we attempt to argue for?

2. Is there a minimum/optimum separation between antennae?

3. What is the minimum arm length?

4. Can we quantify the trade-offs in length versus number of separate antennae versus number of interferometers in one installation? Can we define and defend a minimum investment? Can we quantify the gains in going from that minimum?

5. Should we ever try to decide between Fabry-Perot and delay line? Can we produce a basic design compatible with both techniques?

6. What are the arguments for building the antennae simultaneously? Do we have the scientific resources to build and commission them simultaneously? What are the arguments against building only one antenna, proving it, and then building the next?

7. How much can be done in common, how much should be done in common, and how much must be done in common?

1

Ian Corbett, director of Rutherford Appleton Laboratory in Chilton

Ian Corbett, Aprile 24, 1987 to the optical teams:

The WP must produce arguments which convince the funding agencies not only of the importance and timeliness of the science and technological feasibility of the project, but also of the ability and determination of the separate groups to work together.

European GW Detector Working Party, just established among Glasgow, Garching and Orsay

European Gravitational Wave Detector Working Party

8. Should we have a common data acquisition, storage and analysis philosophy from the start? Should we have a single European data storage and analysis centre, networked to the sites and to the collaborating institutions? (Some of this will come out of the July Cardiff meeting.)

9. What will the relationship be with other detectors e.g. in the USA? Should there be worldwide standardisation on e.g. protocols and software?

10. How do we organise the collaboration? Do we envisage a single co-ordination and management committee for the whole project comprising several antennae and many interferometers? Should this committee have financial authority delegated by the funding agencies, or should the various national groups contribute in equipment and manpower, under their own control? How do we maintain the integrity of the national groups? How do we minimise bureaucracy while retaining accountability?

11. What existing collaborative projects could provide a useful model? (or, conversely, indicate things to avoid!)

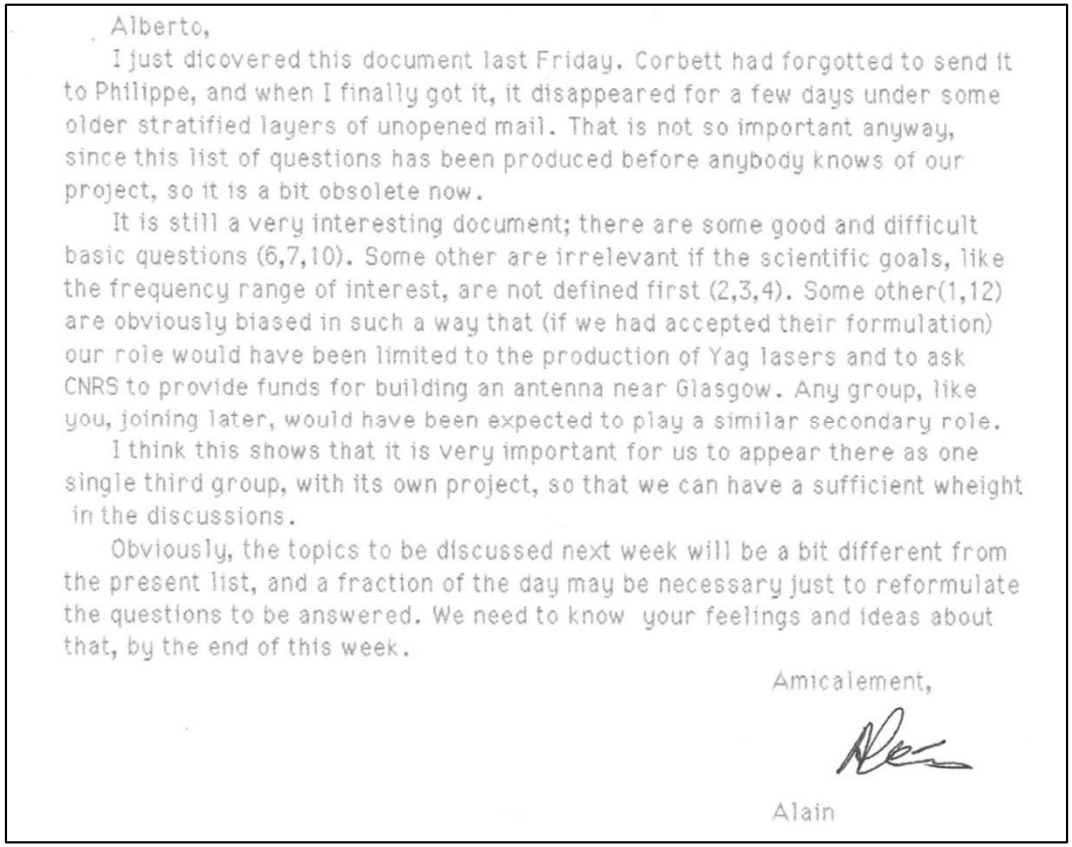
12. What is the long-term role of the two prototype detectors (Garching and Glasgow)? Should the extent of prototype R&D be expanded? When?

13. What should we propose in the future to the European Commission? What is the best way of continuing and extending present EC funded work? What other source(s) of funds could be approached?

24 April 1987

Ian Corbett, Aprile 24, 1987 to the optical teams

Ian Corbett, director of Rutherford Appleton Laboratory in Chilton



Alberto,

I just dicovered this document last Friday. Corbett had forgotted to send it to Philippe, and when I finally got it, it disappeared for a few days under some older stratified layers of unopened mail. That is not so important anyway, since this list of questions has been produced before anybody knows of our project, so it is a bit obsolete now.

It is still a very interesting document; there are some good and difficult basic questions (6,7,10). Some other are irrelevant if the scientific goals, like the frequency range of interest, are not defined first (2,3,4). Some other(1,12) are obviously biased in such a way that (if we had accepted their formulation) our role would have been limited to the production of Yag lasers and to ask CNRS to provide funds for building an antenna near Glasgow. Any group, like you, joining later, would have been expected to play a similar secondary role.

I think this shows that it is very important for us to appear there as one single third group, with its own project, so that we can have a sufficient wheight in the discussions.

Obviously, the topics to be discussed next week will be a bit different from the present list, and a fraction of the day may be necessary just to reformulate the questions to be answered. We need to know your feelings and ideas about that, by the end of this week.

Amicalement,

Alain

June 1987, Brillet to Giazotto:

This list of questions has been produced before anybody knows of our project, so it is a bit obsolete now. […]
(if we accepted their formulation) our role would have been limited to the production of Yag lasers and to ask CNRS to provide funds for building an antenna near Glasgow. Any group like you, joining later, would have been expected to play a similar secondary role.
I think this shows that it is very important for us to appear as one single third group, with its own project, so that we can have a sufficient weight in the discussions.

A few days later a meeting of European optical groups (the 'European GW Detector Working Party') will be held in Chilton.

Rutherford-Appleton Lab - Chilton (Oxford), June 17, 1987

NOT FOR GENERAL CIRCULATION

Notes on first meeting of European Gravitational Wave Detector Working Group

17 June 1987 at RAL

Present:-

A Brillet (Orsay, Paris)
I F Corbett (RAL)
J Hough (Glasgow)
G Leuchs (MPI, Garching)
B F Schutz (Cardiff)
Ph. Tourrenc (Paris)
W Winkler (MPI, Garching)

1. OBJECTIVES OF WORKING GROUP

1.1 To prepare and present the scientific case for constructing and exploiting an array of collaboratively funded and constructed Gravitational Wave Detectors, taking some account of financial constraints.

1.2 To discuss and formulate an agreed collaborative policy covering the design, construction, commissioning, operation and development of detectors.

1.3 To propose possible management structures for the project.

1.4 To summarise conclusions and recommendations in a report to be presented to BMFT, CNRS, INFN and SERC.

2. SUMMARIES OF STATUS OF CURRENT PROJECTS

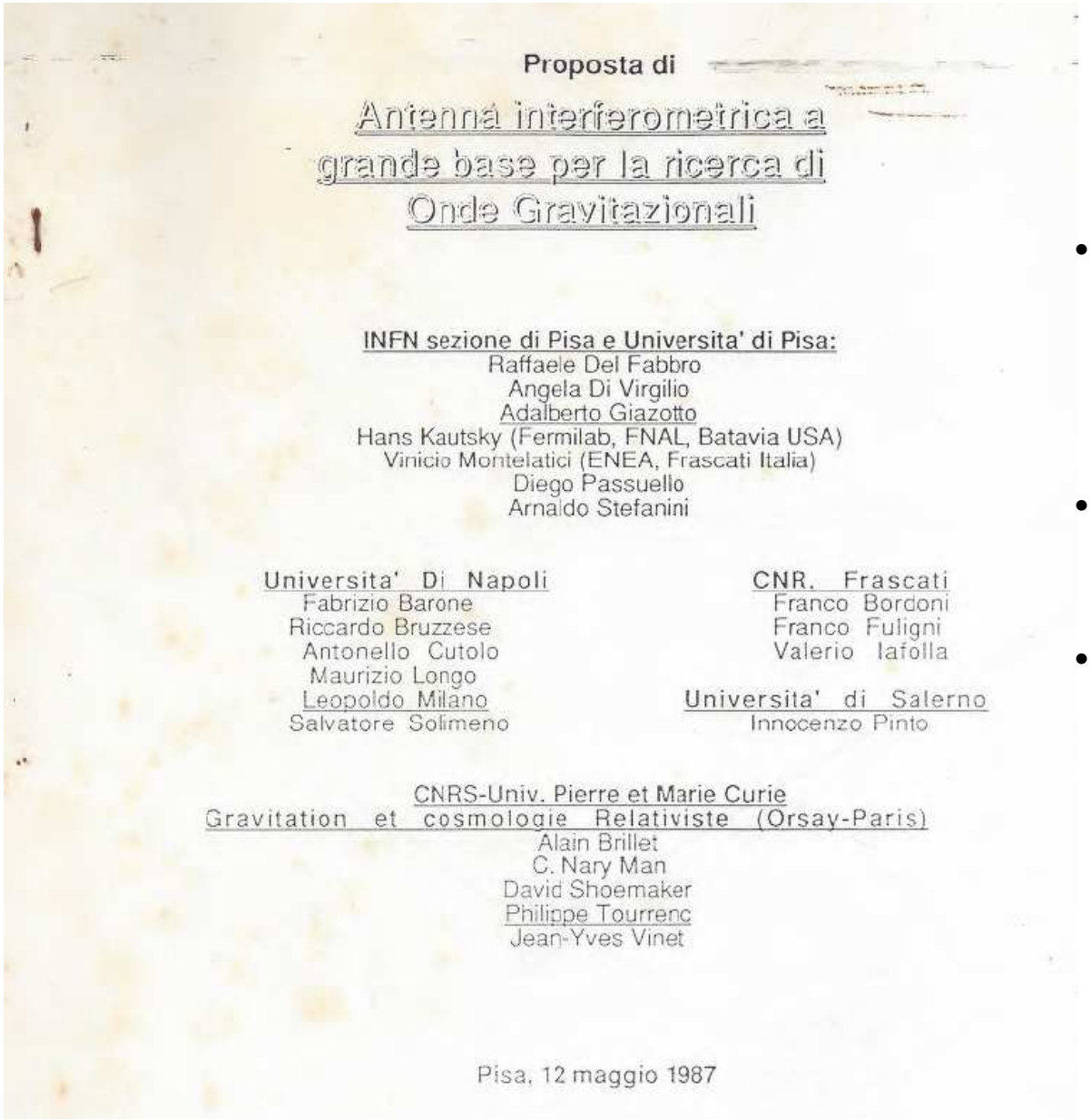
2.1 Garching - G Leuchs

The MPI proposal is being updated and will be presented for review to a BMFT panel. Their comments and conclusions are expected early 1988. There may be some money for R&D before a decision on the main project is taken.

The senior MPI administration appear (or more) less enthusiastic over the project than they might be.

1st Meeting of the GW detectors working party

May 1987: first French-Italian proposal for an interferometric antenna



Proposta di

Antenna interferometrica a grande base per la ricerca di Onde Gravitazionali

INFN sezione di Pisa e Universita' di Pisa:
Raffaele Del Fabbro
Angela Di Virgilio
Adalberto Giazotto
Hans Kautsky (Fermilab, FNAL, Batavia USA)
Vinicio Montelatici (ENEA, Frascati Italia)
Diego Passuello
Arnaldo Stefanini

Universita' Di Napoli
Fabrizio Barone
Riccardo Bruzzese
Antonello Cutolo
Maurizio Longo
Leopoldo Milano
Salvatore Solimeno

CNR. Frascati
Franco Bordoni
Franco Fuligni
Valerio Iafolla

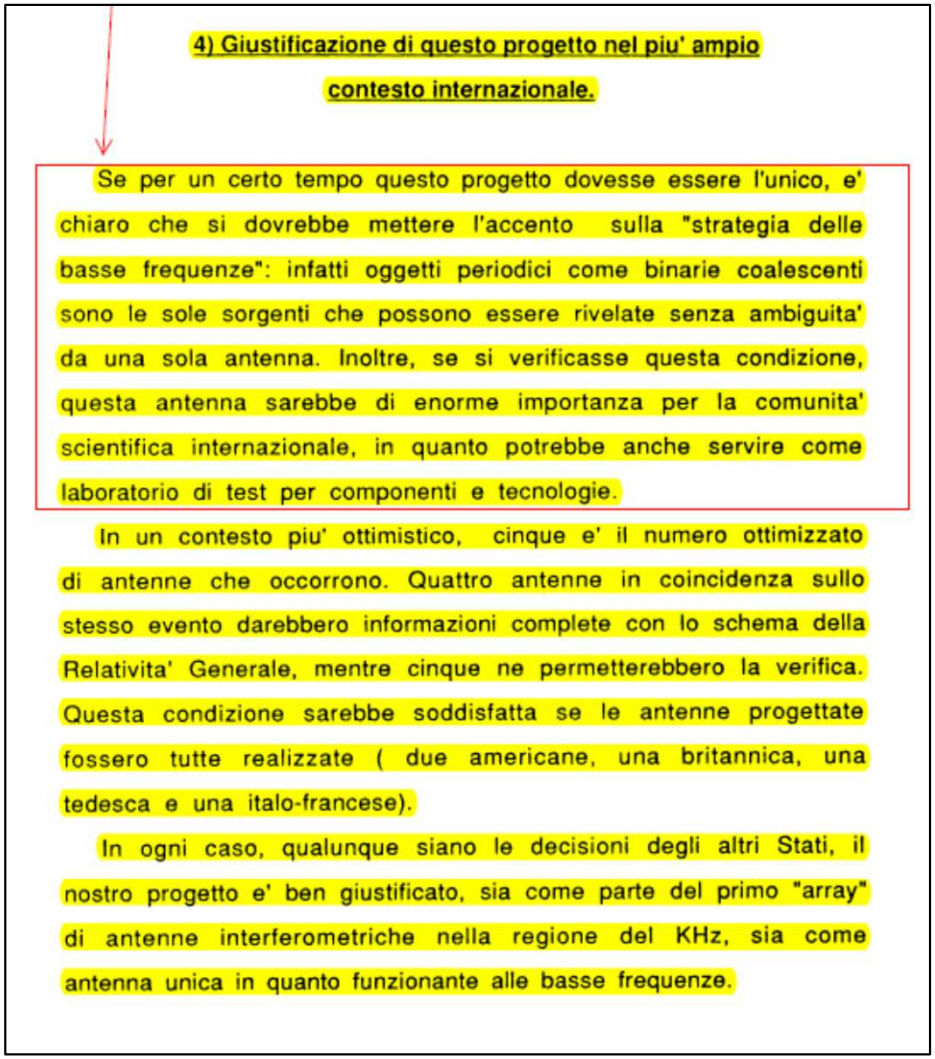
Universita' di Salerno
Innocenzo Pinto

CNRS-Univ. Pierre et Marie Curie
Gravitation et cosmologie Relativiste (Orsay-Paris)
Alain Brillet
C. Nary Man
David Shoemaker
Philippe Tourrenc
Jean-Yves Vinet

Pisa, 12 maggio 1987

- **An urgent proposal: pressure from Italy to submit a proposal to INFN, in time to be included in the next five-year plan 1988-93**
- **Critical mass: 4 Italian groups (Pisa, Naples, Frascati, Salerno)**
- **No optical group among the Italian teams: a fundamental role of the Orsay group in the proposal**

May 1987: first French-Italian proposal for an interferometric antenna



4) Giustificazione di questo progetto nel piu' ampio contesto internazionale.

Se per un certo tempo questo progetto dovesse essere l'unico, e' chiaro che si dovrebbe mettere l'accento sulla "strategia delle basse frequenze": infatti oggetti periodici come binarie coalescenti sono le sole sorgenti che possono essere rivelate senza ambiguita' da una sola antenna. Inoltre, se si verificasse questa condizione, questa antenna sarebbe di enorme importanza per la comunita' scientifica internazionale, in quanto potrebbe anche servire come laboratorio di test per componenti e tecnologie.

In un contesto piu' ottimistico, cinque e' il numero ottimizzato di antenne che occorrono. Quattro antenne in coincidenza sullo stesso evento darebbero informazioni complete con lo schema della Relativita' Generale, mentre cinque ne permetterebbero la verifica. Questa condizione sarebbe soddisfatta se le antenne progettate fossero tutte realizzate (due americane, una britannica, una tedesca e una italo-francese).

In ogni caso, qualunque siano le decisioni degli altri Stati, il nostro progetto e' ben giustificato, sia come parte del primo "array" di antenne interferometriche nella regione del KHz, sia come antenna unica in quanto funzionante alle basse frequenze.

Main feature that distinguishes the antenna from German, British and American projects:

We will try to be the first to explore the low frequencies […]. The Italian group has acquired an expertise in low frequency strategy, which is not comparable to any other in the world.

The low-frequency strategy aimed to be independent of the fate of other interferometric designs and of collaboration with other comparable experiments.

Report of an Ad-Hoc Working Group on the Future of Interferometric Gravitational Wave Antennas in Europe.

March 1988

Membership of Working Group:

A Brillet CNRS - Univ. Pierre et Marie Curie, Paris

I F Corbett Rutherford Appleton Laboratory

A Giazotto INFN sezione di Pisa e Univ. di Pisa

J Hough University of Glasgow

G Leuchs Max-Planck-Institut fur Quantenoptik, Garching

B F Schutz University College, Cardiff

Ph Tourrenc CNRS - Univ. Pierre et Marie Curie, Paris

W Winkler Max-Planck-Institut fur Quantenoptik, Garching

SUMMARY

This report examines the scientific case for constructing interferometric gravitational wave antennas, and argues that a network of detectors is required if complete astrophysical observations are to be possible. For Europe this need is best satisfied by the construction of three independent, but networked, interferometers. For each instrument, the limiting background signal spectral density should be significantly better than 3.10-23/Hz (corresponding to a strain sensitivity of better than 10-21 for a 1 kHz bandwidth), over a frequency range extending from a few kilohertz down to tens of hertz, if possible. Such a sensitivity over a wide bandwidth could result in the annual observation of several hundred events of various origins.

Although the detailed scientific priorities and strategies that have been selected are different, the proposals presented to their respective funding bodies by UK, German and Italian-French groups already incorporate these goals, and the working group has established a framework for active collaboration between these groups. This is now operational, and five specialist groups have been formed to work on different aspects of the design of long-baseline interferometers. The aim is to find cost-effective solutions to the many common design problems whilst retaining the independence and flexibility necessary to respond to different funding scenarios.

Collaboration in the construction of detectors would probably best be done through conventional bi-lateral agreements.

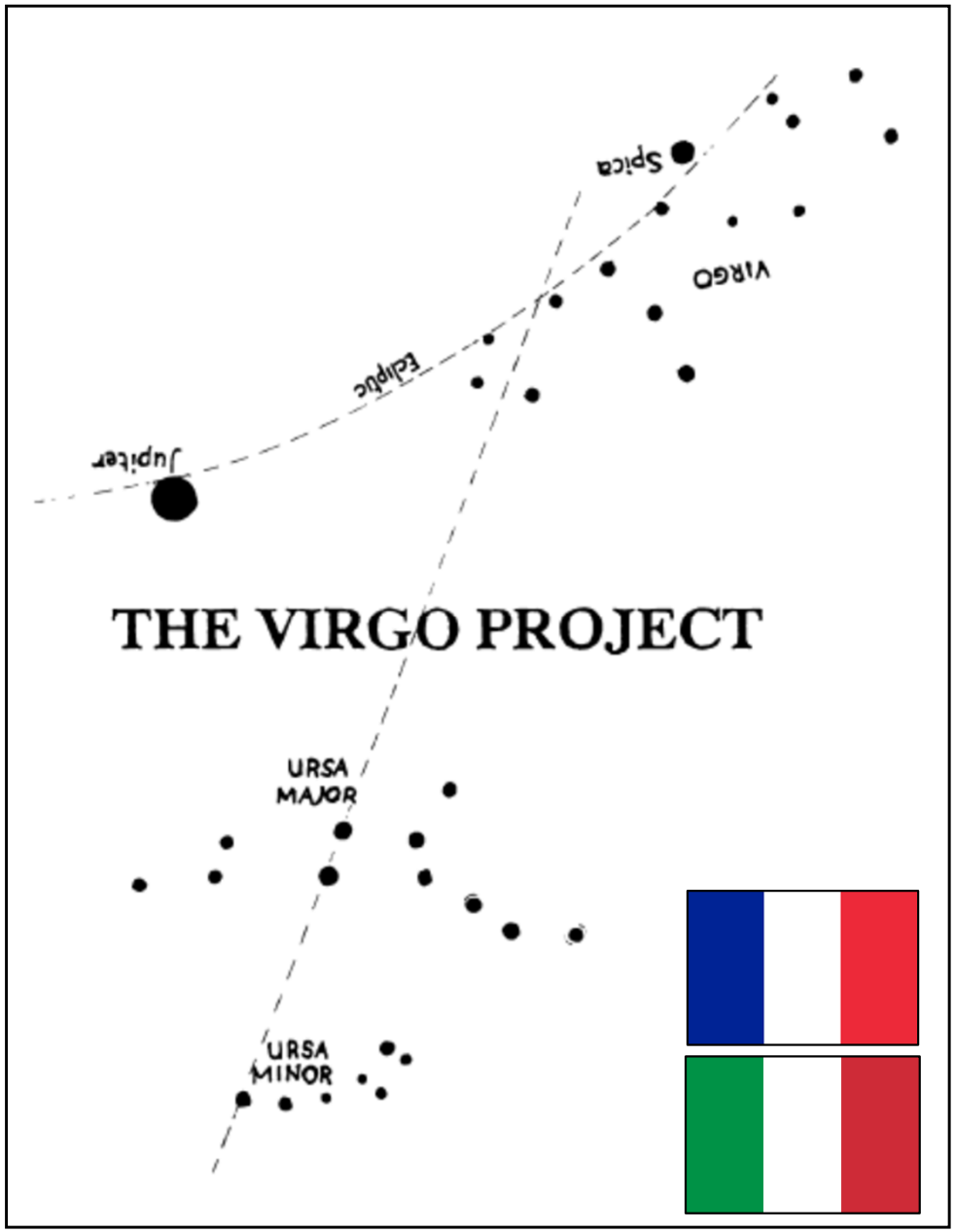
2.BACKGROUND

All the European groups working on the interferometric detection of gravitational radiation have been collaborating successfully for several years. Early in 1987 it became clear that the rate of progress and the performance levels actually achieved were such that the groups should put forward a coherent plan for the joint development and realisation of a

Report of March 1988: EUROGRAV is born

Early in 1987 it became clear that the rate of progress and the performance levels actually achieved (by the European groups) were such that the groups should put forward a coherent plan for the joint development and realization of a network of interferometric antennas. As a result, a representative ad hoc group met on three occasions to discuss and formulate the objectives and working principles of a European collaboration, now chistened EUROGRAV, to design, build and operate such a network.

1989 Proposals: from 3 to 2 European long based interferometers



If you wish to know more about this story…

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THE EUROPEAN PHYSICAL JOURNAL H

Regular Article

EUROGRAV 1986–1989: the first attempts for a European Interferometric Gravitational Wave Observatory

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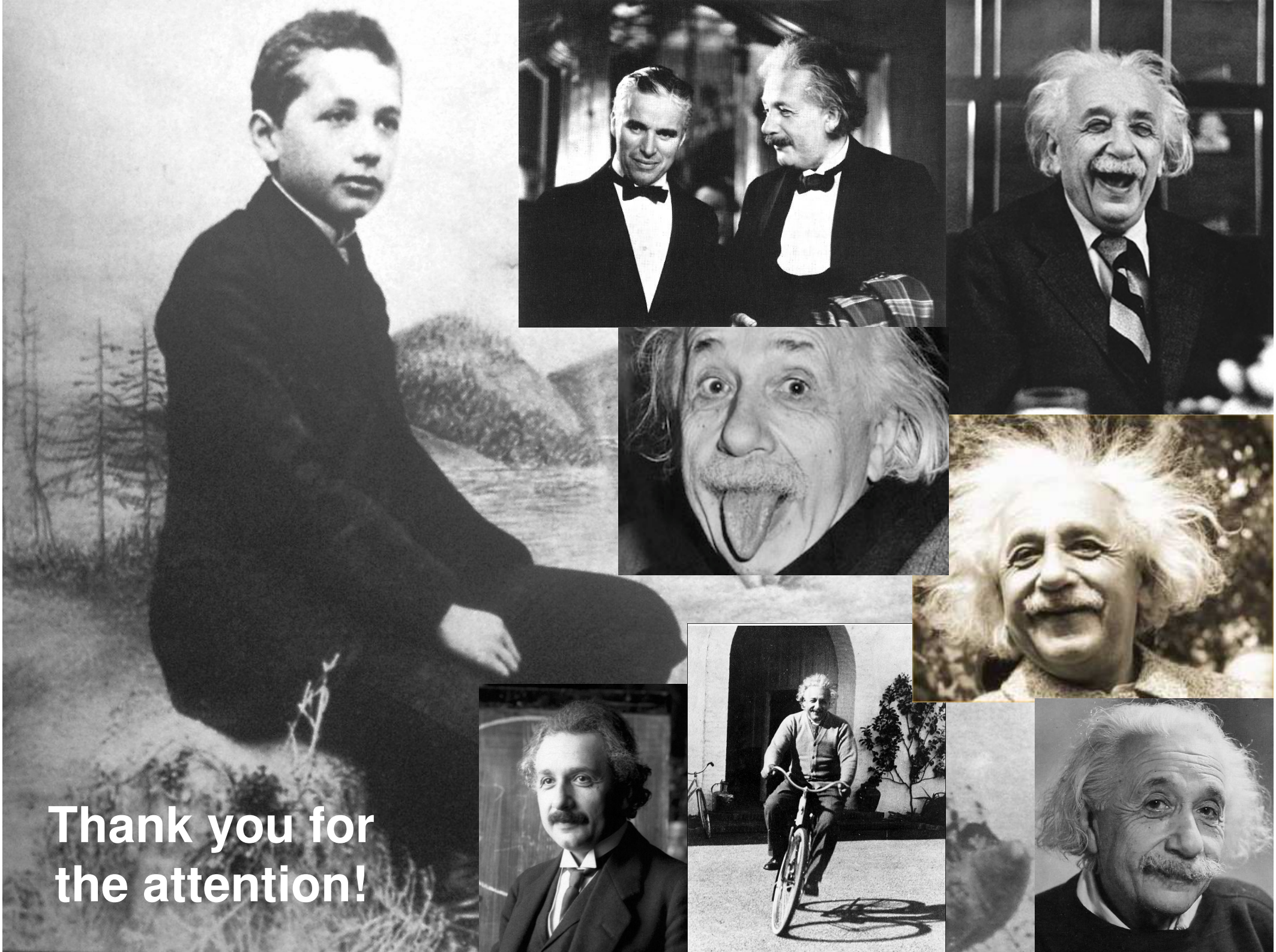
Abstract At the turn of the 1980s and 1990s, on the eve of the great leap in scale from the resonant bars to the long-baseline interferometers LIGO and Virgo, the four European groups then engaged in the field of interferometric gravitational wave detection in Germany, UK, France and Italy tried to set up a common strategy, with the aim of establishing a network of three long-based antennas in Europe. The paper analyzes the main causes of the failure of those early plans. An attempt is made to outline the parallels and differences with the current times, on the eve of the new leap of scale toward the third generation of gravitational wave interferometers, while the negotiations for the European-born project Einstein Telescope are taking place.

1 Introduction

In the field of gravitational wave detection there is an evident asymmetry that distinguishes the two scientific shores of the Atlantic Ocean. The two LIGO antennas in the USA endow the country with the effective ability to autonomously detect some new kind of transient gravitational signal, such as the gravitational radiation emitted by a supernova, until now still undetected. Instead, the single long-baseline interferometric detector Virgo, located in Italy, does not guarantee the European scientific community its own independence of observation.

This asymmetric situation was also true for the first detections of gravitational radiation from coalescing binary


Thank you for
the attention!

BACK UP SLIDES

London, November 1990

Big history intercepts the small community of gravitational waves

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Our Ref: P/SG/603

1 February 1991

Dear Dr Brillet

BRITISH-GERMAN GRAVITATIONAL WAVE PROJECT - GEO

Thank you for the letter of 17 January 1991 signed by yourself, Professor Giazotto and Dr Tourrenc.

The SERC and I fully recognise the importance of the GEO project in the international context of gravitational wave research and the fact that all the proposed projects are to some degree interdependent. I am also aware of the high regard internationally for the UK groups at Glasgow, Cardiff and Rutherford Appleton Laboratory and the scientific significance of this field of research. However, the overall SERC funding position for 1991/92 and subsequent years has been seriously undermined by the very poor Public Expenditure Survey outcome for science announced in November 1990. As a result SERC is having to examine the whole of its programme to assess its future direction and balance, and to determine where economies can be made with minimum scientific damage.

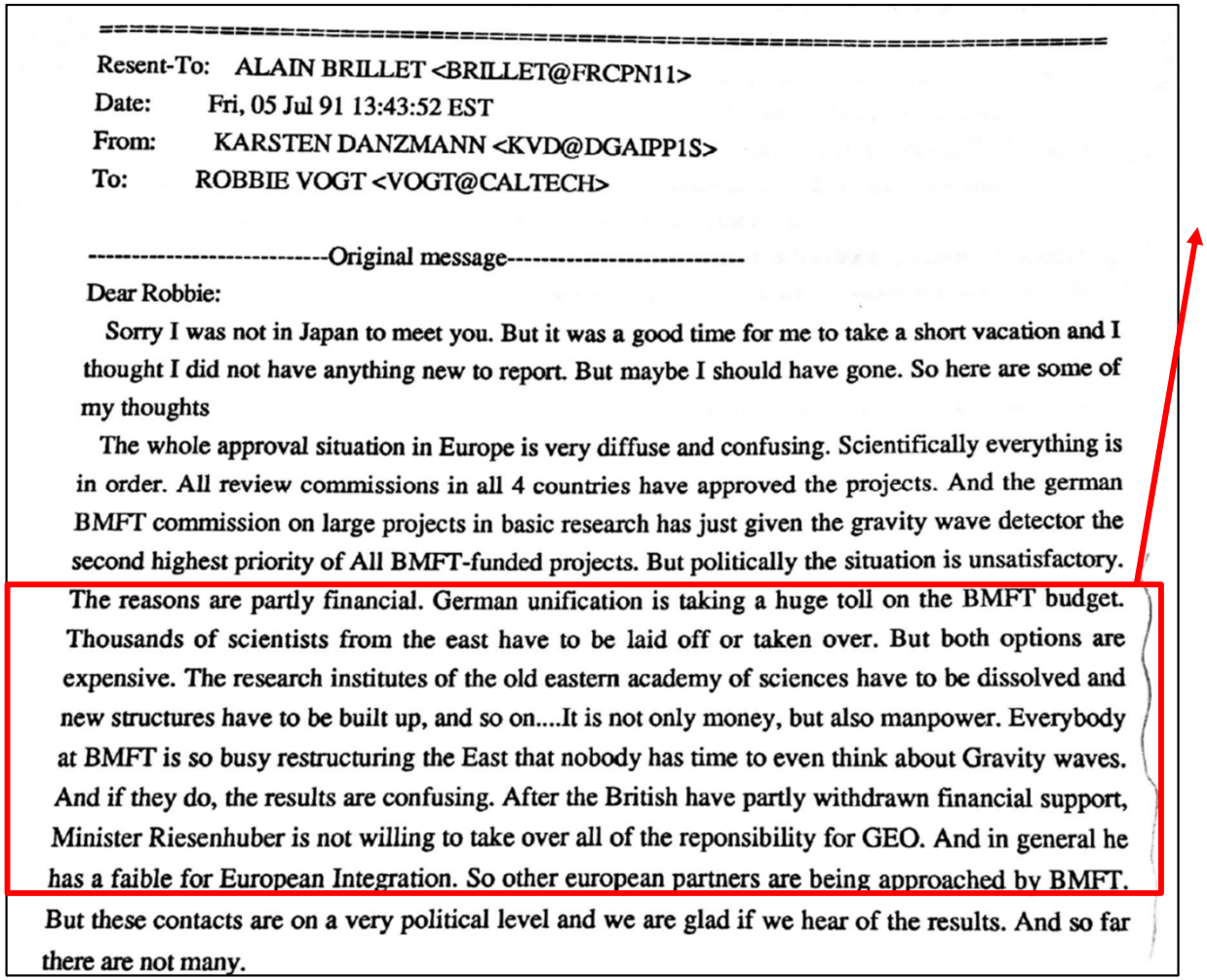
In the short term SERC is having to consider delaying participation in several projects by up to 5 years; GEO may well be one of these projects. This would be an enforced delay and does not signal decision or wish to withdraw from the project.

Sir Mark Richmond, Chairman of SERC, to Brillet – February 1, 1991

[…] the overall SERC funding position for 1991-92 and subsequent years has been seriously undermined by the very poor Public Expenditure Survey outcome for science announced in November 1990.
[…]
In the short term SERC is having to consider delaying participation in several projects by up to 5 years; GEO may well be one of these projects.

Berlin, November 1989

Big history intercepts the small community of gravitational waves



Resent-To: ALAIN BRILLET <BRILLET@FRCPN11>
Date: Fri, 05 Jul 91 13:43:52 EST
From: KARSTEN DANZMANN <KVD@DGAIPP1S>
To: ROBBIE VOGT <VOGT@CALTECH>

----------Original message----------

Dear Robbie:

Sorry I was not in Japan to meet you. But it was a good time for me to take a short vacation and I thought I did not have anything new to report. But maybe I should have gone. So here are some of my thoughts

The whole approval situation in Europe is very diffuse and confusing. Scientifically everything is in order. All review commissions in all 4 countries have approved the projects. And the german BMFT commission on large projects in basic research has just given the gravity wave detector the second highest priority of All BMFT-funded projects. But politically the situation is unsatisfactory. The reasons are partly financial. German unification is taking a huge toll on the BMFT budget. Thousands of scientists from the east have to be laid off or taken over. But both options are expensive. The research institutes of the old eastern academy of sciences have to be dissolved and new structures have to be built up, and so on....It is not only money, but also manpower. Everybody at BMFT is so busy restructuring the East that nobody has time to even think about Gravity waves. And if they do, the results are confusing. After the British have partly withdrawn financial support, Minister Riesenhuber is not willing to take over all of the reponsibility for GEO. And in general he has a faible for European Integration. So other european partners are being approached by BMFT. But these contacts are on a very political level and we are glad if we hear of the results. And so far there are not many.

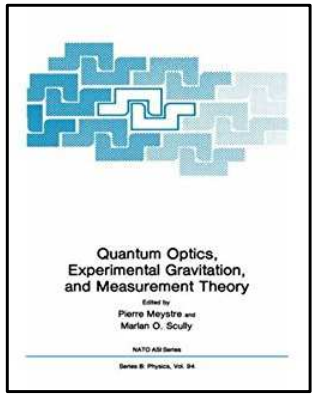
Danzmann, leader of Garching group after Leuchs (since 1989), to Vogt, director of LIGO - July 5, 1991

German unification is taking a huge toll on the BMFT budget. Thousands of scientists from the east have to be laid off or taken over. But both options are expensive. The research insitutes of the old eastern academy of sciences have to be dissolved and new structures have to be built up, and so on… It is not only money, but also manpower. Everybody at BMFT is so busy restructuring the East that nobody has time to even think about Gravity waves. […] Minister Riesenhuber is not willing to take over all the responsability for GEO. And in general he has a faible for European Integration.

BMFT: German Federal Ministry of Education and Resaerch

Conferences where the GW community met…

- **1979**: Marcel Grossmann Meeting on GR (MG2) **Trieste**. Precision experiments on Gravitation: **Brillet**, **Hall**, *On improved test of the Isotropy of space using laser tehniques*. Brillet meets for the first time Drever and the group of Garching, presenting their first interferometric results.



- **1981**: Conference on Quantum Optics and Experimental General Relativity: **Bad Windsheim** (Germany). Promoted by NATO.

Some of the participants: Wigner, **Wheeler**, **Bordé**, **Brillet**, **Leuchs**, **Thorne**, **Hough**, **Drever**, **Maischberger**, **Braginsky**

- **1984:** Journées Relativistes, May 2-5, **Aussois** (France). Organized by **Philippe Tourrenc**, dir. of Lab. de Physique Théorique, Institut Henri Poincaré (Paris). The Glasgow group first presents its ideas for a large gw interferometer.

- **1985**: Marcel Grossmann Meeting (MG4), **Rome**. Garching group presents: Plans for a large GW antenna in Germany. Brillet meets for the first time Giazotto.

IV Marcel Grossmann Meeting, Roma 1985

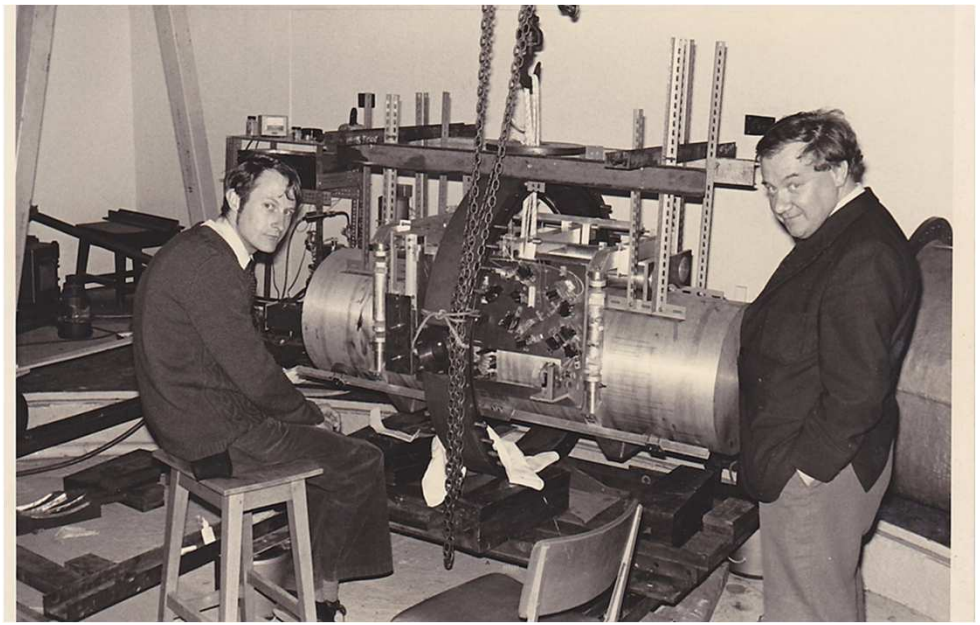
Vinet J.Y. , *Optimization of resonant interferometric detectors of gravitational radiation*, in Proceedings of the Fourth Marcel Grossmann Meeting on General Relativity - Rome, 1985

«[…] *This paper discusses the efficiency of the synchronous recycling when involving multipass delay lines or Perot-Fabry cavities*.»

Jean-Yves Vinet, 1982

IV Marcel Grossmann Meeting, Roma 1985

Newton G., **Hough** J., **Kerr** G., **Meers** B., **Robertson** N., **Ward** H., **Mangan** J., **Hoggan** S., **Drever** R., *Some improvements to the Glasgow gravitational wave detector,* in Proceedings of the Fourth Marcel Grossmann Meeting on General Relativity - Rome, 1985



Jim Hough and Ron Drever, Glasgow 1972

IV Marcel Grossmann Meeting, Roma 1985

Shoemaker D., **Winkler** W., **Maischberger** K., **Rüdiger** A., **Schilling** R., **Schnupp** L., *Progress with the Garching 30-meter prototype for a gravitational wave detector*, in Proceedings of the Fourth Marcel Grossmann - Rome, 1985

Winkler W., **Maischberger** K., **Rüdiger** A., **Schilling** R., **Schnupp** L., **Shoemaker** D., *Plans for a Large Gravitational Wave Antenna in Germany*, in Proceedings of the Fourth Marcel Grossmann Meeting on General Relativity - Rome, 1985

Walter Winkler and Karl Maischberger, Garching 1970s