# International Association of Seismology and Physics of the Earth's Interior

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In your reply refer to our ref:

# NEWSLETTER NO. 4 JUNE 1981

TO: National Correspondents, Officers and Representatives of the Association and related organizations.

Preparations are continuing well for the forthcoming 21st General Assembly of the Association at London, Ontario 21-30 July. Professor Alan Beck and his Organizing Committee report that over 400 abstracts have been submitted, and the programme promises to be of exceptional interest.

Other Association affairs are also progressing well, and it is pleasing that this Newsletter contains many submitted reports of meetings. Please remember that I am anxious to include in the Newsletter comments on all activities of interest, including news of developments in regional and national recording networks, particularly those outside Europe and North America.

We look forward to seeing many participants at London in July.

Robin Adams

R D Adams Secretary-General

# GENERAL ASSEMBLY, LONDON, ONTARIO 21-30 JULY 1981

As mentioned above, it seems that an exceptionally good attendance can be expected. All sessions have full programmes, but some minor re-adjustment of the times of particular sessions may have to be made to fit in with last-minute alterations. There is also a full programme of evening events, both social and technical. The Association acknowledges with thanks grants of \$3,000 from IUGG towards helping the attendance of Young Scientists, and of \$10,000 from Unesco. These sums have been allocated through convenors of sessions.

Many related organizations will be taking the opportunity of the London Assembly to hold meetings. Among them are:

First Meeting of the Inter-Union Commission on the Lithosphere (18-20 July) Executive Committee IUGG (25-26 July) Governing Council, International Saismological Centre (31 July - 1 August) Strong Motion Array Council (Joint IAEE and IASPEI)

Many IASPEI Commissions will also be holding business meetings.

For all Assembly queries, please continue to get in touch with: Prof A E Beck Dept of Geophysics, University of Western Ontario London, Ontario, CANADA N6A 5B7

#### Formal Business Sessions

As stated in Newsletter No. 3, these are scheduled for 21 July 0900-1100 and 30 July 1600-1730. It is likely that an extra session will be held in the late afternoon of 21 July.

The full Agenda will be circulated at London, but National Correspondents should note that the main items are likely to be:

- (1) Revision of Statues (as detailed in Newsletter 3).
- (2) Proposed guidelines for appointment and operation of IASPEI Commissions.
- (3) Scientific Programme for 1983 General Assembly in Hamburg.
- (4) Venue for 1985 General Assembly.
- (5) Proposal and adoption of Resolutions.

Although the main business meetings of the Association are at those Assemblies held in conjunction with full Assemblies of IUGG, any other items of Association business may also be discussed.

## INTER-UNION COMMISSION ON THE LITHOSPHERE

The Commission will hold its first meeting in London, Ontario, 18-20 July 1981, immediately before the IASPEI Assembly. The following Working Groups and Co-ordinating Committees are being set up to help the Commission implement its ten-year programme to elucidate the nature, origin, development and evolution of the lithosphere, with special reference to the continents:

## Working Groups

- 1. Recent plate movements and deformation. Chairman: K Kasahara (Japan), Vice-Chairman: P Vyskocil (Czechoslovakia)
- 2. Phanerozoic plate motions and orogenesis. Chairman: R Van der Voo (USA), Vice-Chairman: J Monger (Canada)
- 3. Proterozoic lithospheric evolution. Chairman: A Sidorenko (USSR), Vice-Chairman: A Kroner (FRG)
- 4. The Archaen Lithosphere. Chairman: B Windley (UK), Vice-Chairman: R Hargraves (USA)
- 5. Intraplate phenomena. Chairman: P Ziegler (Netherlands), Vice-Chairman: D Roberts (UK)
- 6. Nature and evolution of the oceanic lithosphere. Chairman: D Hussong (USA), Vice-Chairman: J Francheteau (France)
- 7. Paleoenvironmental evolution of the oceans and atmosphere. Chairman: K Hsu (Switzerland), Vice-Chairman: V Krasheninnikov (USSR)
- Subduction, collision and accretion. Chairman: K Kobayashi (Japan), Vice-Chairman: H Gnibidenko (USSR)
- 9. Processes and properties in the Earth that govern lithospheric evolution. Chairman: C Froidevaux (France), Vice-Chairman: N Sobolev (USSR)

#### Co-ordinating Committees

The following committees are being set up to act as liaison among Working Groups, and between them and other interested bodies:

- Environmental Geology and Geophysics. Chairman: V Magnitsky (USSR), Vice-Chairman: Arnould (France)
- Mineral and energy resources. Chairman: R Sillitoe (UK), Vice-Chairman: A Welte (FRG)
- Geosciences within developing countries. Chairman: D Ajakaiye (Nigeria), Vice-Chairman: P Nutalaya (Thailand)
- 4. Evolution of magmatic and metamorphic processes. Chairman: V Sobolev (USSR), Vice-Chairman: H Zwart (Netherlands)
- 5. Structure and composition of the lithosphere and asthenosphere. Chairman: K Fuchs (FRG), Vice-Chairman: T Jordan (USA)
- Continental drilling. Chairman: H Vidal (FRG)
- Data centres and data exchange. Chairman: M Chinnery (USA) (or A Shapley, USA)
- 8. Co-ordinating Committee of National Representatives.

# STAFF CHANGES AT INTERGOVERNMENTAL ORGANIZATIONS

The new Director of the Division of Earth Sciences of Unesco, in Paris, is Dr V Sbrava, of Czechoslovakia, who replaces Dr E M Fournier d'Albe. The Division's Programme Specialist, Dr K Kitazawa, who has been involved in many seismological programmes, is moving to a more senior post in the Intergovernmental Oceanographic Commission of Unesco.

Dr J F Tomblin, of Trinidad and Tobago, has completed his first year's assignment with UNDRO in Geneva, and Dr V Karnik, of Czechoslovakia, took up in April 1981 a twoyear appointment in UNDRO's office of the Disaster Relief Co-ordinator, also in Geneva.

We wish these gentlemen success in their new appointments, and look forward to the continuing co-operation with their organizations.

## COMMISSION FOR THE GEOLOGICAL MAP OF THE WORLD

Miss Frances Delany, the Commission's Secretary-General, has supplied the following information about its activities:

The Commission for the Geological Map of the World (CGMW), the agency of the International Union of Geological Sciences (IUGS) charged with promoting small-scale earth science maps, has published and/or prepared a series of continental maps which include geologic, tectonic, metallogenic, metamorphic and hydrographic. The contribution that geological data can bring to understanding not only surface but also deepseated phenomena is obvious, and the profits to be gained by integrating geologic and geophysical data on maps has led the CGMW to propose liaison with suitable IUGG bodies, in particular, to promote joint projects. This initiative corresponds with the initiation of the International Lithosphere Project and the CGMW hopes that the first steps can be taken during the IASPEI General Assembly in London, Ontario, 1981.

## MEETING REPORTS

Mathematical Problems of the Thermal and Dynamic State of the Earth Lake Arrowhead, California, USA July-August 1980

An international conference devoted to Mathematical Problems of the Thermal and Dynamic State of the Earth was held from 28 July - 3 August 1980, at the Lake Arrowhead Conference Center of the University of California. Attending the conference were 85 scientists from 12 countries, including 15 graduate students.

The aim of the meeting was to focus attention on some of the outstanding problems raised in recent years regarding the thermal state of the Earth's interior, including such questions as:

- (1) What are current estimates of temperatures in the Earth's core and what constraints do these place upon the operation of the geomagnetic dynamo?
- (2) How much heat is flowing across the core-mantle boundary?
- (3) If convection is mantle-wide, does this consist of a single flow pattern extending from the core-mantle boundary to the base of the lithosphere, or are there separate convection systems in the upper and lower mantle?
- (4) What observational techniques are pertinent to the question of the thermal state of the Earth's interior and what do recent analyses reveal?
- (5) What are the implications of whole-mantle convection for the thermal evolution of the Earth?

Although a uniform consensus on all of these questions did not emerge from the meeting, there was general agreement that convection in the lower mantle now appears required by several lines of evidence. This conclusion in turn implies a substantial flow of heat across the core-mantle boundary and heat sources in the core to prevent its freezing during the lifetime of the Earth. Either latent heat released by growth of the inner core or the presence of  $K^{40}$  in the outer core may be sufficient for this purpose.

Details of the scientific proceedings from the meeting will be published in EOS. (GLYN JONES, USA)

# International Seminar on Earthquake Prediction and Evaluation of Seismic Risk San Juan, Argentina, October 1980

This interesting seminar co-sponsored by Unesco, UNEP, UNDRO, CERESIS, INPRES and IASPEI, was held in San Juan, Argentina, 20-24 October 1980, in the conference room of the National Institute for Seismic Prevention, INPRES. The meeting was attended by about 100 participants from practically all the South American countries and from Germany, Indonesia, Italy, People's Republic of China, New Zealand, Spain Switzerland, USA and USSR.

Five morning and afternoon sessions were devoted to the presentation of papers related with Seismic Prediction Case Histories, On-Going Prediction Situations for South America, Induced Seismicity, Seismic Risk Evaluation, and Response to Earthquake Prediction. Round tables about these themes were also organized in the evenings.

Of special significance was the presence of a Chinese delegation of six seismologists and geologists from Beijing who gave a series of talks devoted to intracontinental seismicity and earthquake prediction in China, character of Haicheng earthquake anomalies in the short and impending period, reservoir-induced earthquakes in China, and other interesting topics. After the meeting in San Juan the Chinese delegation headed by Prof Ma Xing-Yuan, visited Chile, Peru and Venezuela, this being the first trip of Chinese seismologists to South America.

Another special event was an invited conference by B Brady and W Spence about their hypothesis of the occurrence of a large magnitude earthquake (9.8 modified Richter scale), in the Peruvian and northern Chilean coast predicted for August 1981. This was the first time Brady officially announced this huge earthquake in an open meeting held not very far from the epicentral region. The press was present and gave full information of the conference in local news media. The news spread rapidly to Chile and Peru where all sorts of comments were given in radio, TV and newspapers during the next three weeks.

Although there was not official immediate reaction from the governments involved, the US Geological Survey convened the National Earthquake Prediction Evaluation Council later in January 1981 at the specific request of the Government of Peru. The NEPEC concluded that it is "unconvinced of the scientific validity" of the prediction and does not "recommend any special measures in response to it", and added that "none of the members of the council would have serious reservations about being present personally in Lima at the times of the predicted earthquakes".

Two sessions about space techniques applied to earthquake prediction and public response to predictions attracted considerable interest reflected by the direct and active participation from the floor.

Participants at the Symposium were impressed by the hospitality shown by the people from San Juan and by the local organization committee that offered numerous social events and field trips. Finally, the Governor of San Juan invited all participants to cocktails in his official Residence.

(E.G. KAUSEL, CHILE)

# Seminar on Instability Theory in Continuous Media and Statistics of Earthquake Prediction Napa, California, USA, December 1980

The seminar, held in Napa, California, USA, from 3-6 December 1980, was cosponsored by Unesco and the US Geological Survey (USGS). The seminar was organized by the Working Group on the Theory of Earthquake Prediction of the Committee on Mathematical Geophysics, IUGG. The purpose of the seminar was to discuss possibilities for expanding the theoretical base of studies in earthquake prediction and for developing a connection between short-term histories of seismicity and long-term models of plates at their common boundaries. The latter problem has obvious implications for studies of geodynamics.

The idea of the seminar was to bring together two groups of experts, those versed in the phenomenology and modeling of earthquakes and those versed in non-linear mechanics and mathematical statistics. Since possible links between these fields have been little explored, if at all, most of the time was devoted to the exchange of information in widely separated fields, made possible by the presence of only a limited number of participants. There is evidence that the same plate interactions that lead to earthquakes have strong features of instability that have relevance to longer term processes in crustal and mantle dynamics. Indeed the occurrence of earthquakes themselves may be viewed as a process of instability, in which large earthquakes are the consequences of the previous history of smaller ones. A further level of instability is probably given by descriptions of statistical clustering of earthquakes, such clustering being triggered by non-linear interactions among the predecessor events. On a microscopic scale of individual earthquakes, the anticipatory phases, as well as the earthquake event itself, the instability is described by mechanical processes as well as the complicating features of other physical and chemical processes such as migration of fluids, recrystallization, dislocations. In another branch of geophysical endeavour, modern-day fluid dynamicists are exploring the instabilities that arise in non-linear continuum mechanics. These instabilities have manifested themselves in terms of such concepts as bifurcations, strange attractors, Feigenbaum numbers, etc.

The result of the meeting was an outline of a long-term perspective to construct a bridge across the gulf between the view of the phenomenon of seismicity as a series of discrete events or point processes in a multi-dimensional time-locationmagnitude space, and the view of instabilities in continua as a consequence of non-linearity.

The seminar therefore focused on three mutually related topics; at least they were related after the event of the seminar. First, there was discussion of the identification of statistical properties of patterns of seismicity, including clustering, anti-clustering, migration, and attempts to model the physics and mathematics of the individual seismic event. These processes must be described by non-linear mechanics, rather than usual linear mechanics. Second, the description of methods of treatment of non-linear systems in fluid dynamics and other continuum mechanical systems was presented as well as a discussion of the instabilities that could arise. Third, the possibilities for converting models of discrete processes to systems describable by partial differential equations received attention. Examples of the latter procedure can be given in terms of contemporary developments in the areas of population dynamics and the statistics of random fields.

The discussions frequently returned to assessing the importance of having adequate models on an atomic or elementary level, such as a model for an individual crack, and to the way in which single cracks interact. The interaction can take place, either by integration of individual events into an interactive model for an earthquake sequence, in which one event influences the time-location-magnitude occurrence of another, or on which isolated cracks link together to form larger discrete events.

Although the ultimate continuum system that will be descriptive of the viewing of discrete earthquake phenomena through the wrong end of the telescope, may be different from those considered today by contemporary fluid dynamicists, it is clear that the ultimate system will be non-linear and imbedded in that non-linearity we may expect to observe instabilities of the type already described in recent years, and undoubtedly others as well.

The long-term value of such continuum descriptions of earthquake phenomena is that it has implications for our ability to model the boundary conditions at plate contacts and hence to influence the nature of models of plate motions. But that is very far in the future.

(EDO NYLAND, USA)

# Conference on Large Earthquakes Napier, New Zealand, January-February 1981

On 3 February 1931, New Zealand's worst earthquake disaster occurred. The city of Napier was severely damaged, as was nearby Hastings, and 256 people were killed. On the fiftieth anniversary of this event, a Conference on Large Earthquakes was held in Napier. Its purpose was to review New Zealand's ability to anticipate, combat and recover from a similar disaster. It was sponsored by the Royal Society of New Zealand, the New Zealand National Society for Earthquake Engineering, and the New Zealand National Commission for Unesco. The 200 participants came mostly from within New Zealand, but there were severa. from Australia, elsewhere in the South Pacific, and the USA. Professor Adolph Ciborowski, from Warsaw, gave the keynote addresses, speaking on the planning of human settlement and the reconstruction of Skopje, Managua and Montenegro. Thirty other papers were presented. They examined not only the scientific and engineering aspects of large earthquakes, but also the roles of Civil Defence, Police, Fire Service and the insurance industry. The conference thus afforded a rare chance for exchange of ideas among experts in these widely differing areas. The proceedings are to be published later this year by the Royal Society of New Zealand.

(WARWICK D SMITH, NZ)

# Second International Symposium on Seismicity and on Analysis of Seismic Hazard Liblice, Czechoslovakia, 18-23 May 1981

This symposium was organized by the Czechoslovakian Academy of Sciences, for the Commission of the Academies of Sciences of the Socialist Countries for Planetary Geophysics (KAPG), and the European Seismological Commission. About 70 people attended, mainly from Europe, but with some participants from as far afield as India, and the Democratic People's Republic of Korea.

The programme was divided into sections dealing with Seismo-Geology, Tectonics and Mechanism of Seismic Sources; Seismicity and Macroseismic Observations; Ground Motion; and Seismic Hazard, and was enlivened by much discussion following individual papers and after each theme.

Many individual earthquakes, and the seismicity of particular areas were discussed in some detail. Precursory migration of the Montenegran earthquakes of 1979 was detected, and shocks associated with open-cast mining in Poland were reported, some being felt with intensities as high as 6-7. Studies of seismicity patterns included an extraordinary diurnal pattern of occurrence for events in Bulgaria.

Macroseismic observations received much attention, which included a method for quantitative estimation of intensity. A feature of the symposium was the presentation of a draft map of maximum observed intensity throughout Europe on a scale of 1:7 500 000, and an Atlas of Seismological Maps depicting intensities and epicentres in individual countries and regionally in Central and Eastern Europe, produced by the Geophysical Institute, Prague, for KAPG.

The latter part of the meeting included discussion of ground motion and assessments of seismic hazard in particular areas. The problems of maximum magnitude determination were discussed and also general questions of zoning and earthquake insurance.

The gracious surroundings and living conditions at the Castle of Liblice and the exceptional hospitality of the hosts, greatly enhanced the atmosphere of the meeting, and enabled scientific and social exchanges to be combined most profitably and enjoyably. The proceedings will be published by the Czechoslovakian Academy of Sciences, probably towards the end of 1981.

(R D ADAMS, UK)

#### IASPEI COMMISSION ON PHYSICAL PROPERTIES OF THE EARTH'S INTERIOR

The Commission is planning to hold a short Symposium on "Homogeneity and Heterogeneity of the Mantle and Development of the Crust and Lithosphere" in 1982, most likely to take place in association with the meeting of the European Seismological Commission at Leeds, England, in August. Convenors are Prof T J Ahrens of Pasadena and Dr D C Tozer of Newcastle.

# HISTORY OF IASPEI

Prof Rothe's history of the first fifty years of the Association is to appear in its English version in the Bulletin of the Seismological Society of America, probably in the June 1981 issue, and in the original French version in Gerland's Beiträge later this year. Dr Kausel has arranged for a translation into Spanish which we hope to publish in a suitable South American journal.

## NEWS FROM CHINA

US and Chinese scientists have begun a joint research programme to install an array of strong-motion instruments in the People's Republic over the next two years. The array will consist of about 35 modern instruments, initially installed in the Beijing-Tianjing region, but with mobile capability to be moved rapidly to other sites in China if needed.

Recent seismological visitors to China are being shown "earthquake reserves" in Tangshan, where areas of important geological and engineering effects of the 1976 earthquake are being preserved from reconstruction. The main sites of engineering interest are a locomotive factory near the centre of the city, and buildings of the School of Mines in the outskirts. Geological sites preserve a clear fault offset of more than a metre across a road, and an area where the fault crosses a school playground, with both horizontal and vertical displacement visible.

In September 1982, the Seismological Society of China, with sponsorship of Unesco, UNDRO and IASPEI, will hold an International Symposium and Study Tour on Continental Seismicity and Earthquake Prediction. Unfortunately, limitations in the availability of facilities mean that participation at the meeting will be by invitation only.

# DIRECTORY OF WORLD SEISMOGRAPH STATIONS

Volume I of this publication (The Americas) is now available. It is a compilation of detailed information about most the past and present seismograph stations in North America. It contains the location of seismological instruments, their technical characteristics, dates of operation, and availability of data fundamental to data exchange and to science. It may be obtained (price US \$13) from:

World Data Center A for Solid Earth Geophysics (D61) 325 Broadway Boulder, CO 80303, U S A

# STRONG-MOTION EARTHQUAKE DATA

The World Data Center A for Solid Earth Geophysics (WDC-A) and the National Geophysical and Solar-Terrestrial Data Center (NGSDC) are now disseminating to the scientific and engineering community a world-wide collection of strong-motion seismograms. Countries contributing to the strong-motion data base include Australia, Italy, Japan, New Zealand, Rumania, USSR and Yugoslavia. The US Geological Survey's Seismic Engineering Branch has furnished records from its network of operated and co-operative strong-motion stations, including those in Central and South America.

Copies of strong-motion records are available in various formats: 35=mm film, 70-mm film clips, paper copies, as digitized data on punched cards or magnetic tapes. The "Catalog of Seismograms and Strong-Motion Records", which can be ordered from NGSDC for US \$3, furnishes a listing of most strong-motion records. Enquiries should be addressed to:

National Oceanic & Atmospheric Administration NGSDC/EDIS (D622) Boulder, CO 80303, U S A

#### FORTHCOMING MEETINGS

The following is a selection of meetings from July 1981, in the fields of interest of the Association:

1981 Jul 21-30 IASPEI GENERAL ASSEMBLY

London, Ontario, Canada Prof Beck, Dept of Geophysics, University of Western Ontario London, CANADA N6A 5B7

1981	Aug	24-29	EUROPEAN GEOPHYSICAL SOCIETY MEETING Uppsala, Sweden Dr C E Lund, Box 556, S-75122 Uppsala, SWEDEN
1981	Nov	2- 7	SYMPOSIUM ON PHYSICAL AND GEODYNAMICAL PROCESSES IN EARTHQUAKE FOCAL REGIONS Potsdam, GDR ESC, KAPG Prof E Hurtig, Zentralinstitut fuer Physik der Erde Potsdam, GDR
1981	Nov Dec	30- 4	FIRST INTERNATIONAL WORKSHOP SHAKEISTICS Rome, Italy Italian National Committee for Nuclear Energy RAD-RSI-INGSITO, CSN-CASACCIA, CNEN, C.P. 2400 Rome, ITALY
1981	Dec	7-11	AGU FALL MEETING San Francisco, Cal, USA American Geophysical Union 2000 Florida Avenue NW, Washington DC 20009, USA
1982	May	7-20	GENERAL MEETING IAG (Recent Crustal Movements and Phenomena Associated with Earthquake and Volcanism) Tokyo, Japan IAG, CRCM
1982	May	12-19	THEORY OBSERVATION AND CAUSES OF SEISMIC ANISOTROPY Suzdal, USSR Soviet Geophysical Committee, IASPEI Dr V Magnitsky, Soviet Geophysical Committee, Moscow, USSR
1982	Aug	16-20	4TH INTERNATIONAL SYMPOSIUM ON ANTARCTIC EARTH SCIENCES Adelaide, South Australia SCAR, IUGS Dr J B Jago, Box 1, Ingle Farm, SA 5098, AUSTRALIA
1982	Aug	23-27	EUROPEAN SEISMOLOGICAL COMMISSION - EUROPEAN GEOPHYSICAL SOCIETY Leeds, England ESC Prof J C Briden, Dept of Earth Sciences, The University Leeds, UK
1982	Sep	6-11	7TH EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING Athens, Greece EAEE Technical Chamber of Greece, 4 Karageorgi Servias str, Athens, 125 GREECE
1982	Nov	17-19	OPHIOLITES AND OCEANIC LITHOSPHERE London, UK Geological Society, London Dr S Lippand, Open University, Milton Keynes, MK7 6AA, UK
1983	Aug	15-26	XVIII GENERAL ASSEMBLY OF IUGG Hamburg, FRG International Union of Geodesy and Geophysics Local Organizing Committee IUGG, Postfach 302360, 2000 Hamburg 36 FRG
1983	Aug	27	CENTENNIAL COMMEMORATION OF MOUNT KRAKATAU EXPLOSION Indonesia Indonesian Institute of Sciences LIPI, Jl. Teuku Chik Ditiro 43, Jakarta, INDONESIA