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U.R.S.I.

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OBITUARY
ARTHUR HENRY WAYNICK

It is with deep sorrow that we report the death of Dr. Arthur Waynick, on 1 September 1982, in London, England, while returning from a Geophysical Union meeting.

Both directly through his own work and indirectly through that of his many colleagues and students, Dr. Waynick has profoundly influenced the course of radio science and atmospheric research, both in the United States and abroad. His interest in these fields was established during a period of study at the Cavendish Laboratory from 1937-39. He returned to the United States in 1939 and worked in the Harvard University Underwater Sound Laboratory, transferring to the Pennsylvania State University in 1947. There he joined the Electrical Engineering Department, serving as its Head until his retirement in 1971, and as its first A. Robert Noll Professor.

In 1949 he founded the Ionosphere Research Laboratory at Penn State, serving as its director until his retirement and continuing an active participation until his death. Of particular note was his policy of engaging a group of outstanding international scientists as resident consultants to the Laboratory, a programme which proved immensely productive in engaging both staff and students in cooperative research activities in important new fields of study.

He served as Chairman of the US National Committee for URSI in 1954, was a member of the US National Committee for the IGY, of the NSF Advisory Panel on the IQSY, and of the National Academy of Sciences Geophysical Research Board Panel on the IQSY. He was a member of the National Academy of Sciences Space Science Board Committee on the Atmospheres of the Earth and the Planets, and also served as Chairman of the NSF Advisory Panel on Atmospheric Sciences. He was a Fellow of the IEEE and a member of the National Academy of Engineering.

Art Waynick was a kind and considerate man. He was a continuing source of encouragement, support and counsel to his colleagues and to the many students he guided over the years, stimulating them to their best efforts. He will long be remembered with affection and respect.

John S. Nisbet

GUSTAVE FERRIÉ
PRESIDENT OF URSI 1919-1932

by

C. M. Minnis

Early Years

In 1872 in the French Savoy region, a four-year-old boy, with his mother and sisters, had spent an afternoon in the forest near St-Michel-de-Maurienne. While they were returning home, the little group took the wrong path and then had some difficulty in deciding in which direction they ought to go. The difficulty was resolved when the young boy pointed out some telegraph wires among the trees, for by following these the family was able to return safely to the village. The boy in question was Gustave Ferrié who, 47 years after this early encounter with telegraph lines, was to become the Founder President of the International Union of Scientific Radiotelegraphy: since 1928, the International Union of Radio Science.

Just 50 years have passed since Ferrié's death, and only a very few of those who still have associations with URSI can have had any personal contact with him. On the other hand, those of us who worked at the Laboratoire National de Radioélectricité (LNR) at Bagneux in the years just after World War II could not fail to become aware of this legendary figure and his achievements. Not only had the LNR been conceived by Ferrié in 1926 but, what was probably much more important, many members of the research staff in the post-war years had worked with him during or after World War I; these included Robert Bureau, Fernand Carbenay, Bernard Decaux and Raymond Jouaust, all of whom also played active rôles in URSI over many years, and who are still well remembered.

When Ferrié graduated from the Ecole Polytechnique, he began his career with the Engineers in the French Army in 1889. By 1897, he had been given the command of the Army's School for Telegraphy at Fort Mont-Valérien, but it should not be forgotten that, at the end of the 19th century, only two methods of sending messages quickly over long distances were available: the electric telegraph and the traditional optical semaphore network.

Ferrié and Marconi

After working in England for a year, Marconi decided to give a public demonstration of his new 'telegraphy without wires' in 1897, and on this occasion he was able to send messages over a distance of 14 km. Soon after this event, a French Army officer who had attended the demonstration paid a visit to Ferrié at Mont-Valérien and described what he had seen. Not surprisingly, Ferrié's enthusiasm was aroused, for he immediately foresaw the great advantages that telegraphy without the need for wires could bring to military communications.

A year later, Ferrié was asked to join a small group of French observers during an experiment designed to show that France and Britain could be linked together by radiotelegraphy across the English Channel: in fact, over a distance of 46 km between South Foreland and Wimereux. These tests were to be organised by Marconi's recently formed Wireless Telegraph and Signal Company, but it was stipulated that the equipment to be used at Wimereux was to be completely dismantled afterwards, no doubt in order to protect the rights of the Company. Ferrié was determined not to be a mere uninformed observer of Marconi's experiments and, during the five months preceding the actual event, he himself constructed some equipment which allowed him to gain, at first hand, at least a personal insight into the new radio techniques.

It is worth noting in passing that in 1898 only the 'coherer' was available for the detection of radio waves. This device had been invited by Edouard Branly, and it was very appropriate that it was to him in Paris that Marconi's first message across the English Channel should have been addressed. Ferrié's report on the successful outcome of Marconi's demonstration must have made a strong impression in French government circles; even though he was only a young officer at the time, he was called for an interview with the Minister himself: de Feycinet, a Member of the Academy of Sciences. It seems very likely that the Minister had taken note of Marconi's stipulation concerning the dismantling of the station at Wimereux, for he asked Ferrié whether it would be possible to develop a military wireless telegraph system in France without any foreign assistance. Ferrié's confident, and perhaps rather rash, reply was 'Yes, of course', and the result was that he was given one year in which he was to demonstrate that his self confidence was justified. It is now a matter of history that, at the end of the year, and in spite of many practical and financial problems, satisfactory tests were carried out, over distances of 10-15 km, between the Invalides in Paris, Mont-Valérien and

and the Château at St-Germain-en-Laye.

The XX Century

One of Ferrié's objectives in 1899 was to use radio telegraphy to provide an improved system of communication between Army General Headquarters in Paris and the chain of French fortresses along the Belgian and German frontiers. Since these were several hundred kilometres distant from Paris, he was faced with the need to design high-power transmitters and more sensitive receivers, and to use high antennas. As early as 1898, two French enthusiasts had been able to communicate between the Eiffel Tower and the Dome of the Panthéon, a distance of just over 400 m, using some very primitive equipment. The Tower had been constructed originally for the Paris Universal Exhibition in 1889, but there was considerable support for a proposal to dismantle it. However, the fact that it had been used for radio experiments in 1898 led A.G. Eiffel to offer the 300 m high Tower to Ferrié as a support for radio antennas. Preliminary tests showed that an antenna supported by the Tower would be very effective and, after negotiations, the offer was formally accepted by the French Army in 1903. The first antenna consisted of a 425 m wire running from the top of the Tower down to a tree in the Avenue de Suffren, and connected to the telegraphic equipment installed in wooden huts near the base of the Tower. At the frontier forts, the antennas were supported by captive balloons flying at a height of 400 m. With these installations, ranges of 400 km were attained, and hence Ferrié's first objective had been reached.

By the early years of the century, Ferrié's successes had earned for him a very considerable personal reputation, but it would be quite wrong to think of him as sitting in a comfortable office in Paris, while his staff carried out his instructions elsewhere. He had only a very small, but now famous, workshop at 51 bis Boulevard de Latour-Maubourg where he personally directed the work of a few people. He also worked on his own. For example, he devised the electrolytic detector just before the end of the century; this had great advantages over the coherer since it allowed Morse signals to be read aurally, in spite of interference from atmospherics, whereas the coherer was unable to distinguish signal from noise and allowed everything received to be printed electromechanically.

However, Ferrié was equally ready to deal with the emergencies that arose from time to time far from Paris. In 1902, he installed a temporary wireless telegraph link between

Guadaloupe and Martinique following the destruction of the submarine cable by a volcanic eruption. Some years later, during the Moroccan campaign in 1908, it was decided to investigate the potential value of mobile wireless telegraph stations working under operational conditions. As a result, Ferrié was obliged to improvise, at short notice, mobile horse-drawn vehicles capable of carrying the transmitters and receivers, and also the essential petrol driven dynamos for the power supply. He personally supervised the initial trials of this equipment in Morocco, and also arranged for the relay of messages between the mobile stations and Paris via a French cruiser, moored off Casablanca, which maintained direct contact with the Eiffel Tower station. In 1911, Ferrié visited St-Petersburg, and arranged for the construction of a Russian radio telegraph station near Minsk. The equipment was supplied by the Société Française Radioélectrique and the station came into operation in the Spring of 1914.

Scientific Research

Ferrié's interest in radiocommunications was certainly not confined to the military applications which represented his first responsibility. He foresaw the possibility of using radio time signals as an aid to maritime navigation and, in 1909, he initiated the comparison of astronomical clocks by making use of radio signals from the Eiffel Tower. A year later, following consultations with the Paris Observatory, regular series of time signals were sent out from the Tower. Thanks to the increases in the power of the transmitter, these signals could be heard all over Europe, and also in parts of America and Asia. In view of this, and on the initiative of the French Bureau of Longitudes, it was decided to convene a Conference in Paris with the intention of establishing an International Time Service. This Conference took place in Paris in 1912, and one of its important results was the decision to create the Bureau International de l'Heure (BIH). After 70 years the BIH is still operating at the Paris Observatory, at present under the direction of Dr. Bernard Guinot, and has attained a truly international status. The BIH is one of the constituents of the Federation of Astronomical and Geophysical Services, which is jointly supported by URSI and the Astronomical and Geophysical Unions.

What was probably the earliest determination of the longitude difference between two locations was carried out by Ferrié in the USA after the opening of the station at Arlington, near Washington, in 1913. The success of this experiment

led to a 3-month series of measurements, supervised by Abraham, from which it was concluded that the difference in longitude between the Paris and the Washington Observatories corresponded to a time difference of 5h 17m 36.682s. This value differs from the true value by less than 2 parts in 10^6.

World War I

By 1914, Ferrié already had 16 years of first-hand experience covering the birth of radiotelegraphy and its development as a practical but revolutionary means of communicating over long distances. During this period, he had himself been responsible for, or at least very closely involved with, much of what had been achieved in France.

With the outbreak of war in 1914, he found himself charged with the task of satisfying many new and urgent demands. At the same time he had to take action to reduce the risks inherent in the concentration of all radio research and development work in Paris, which was threatened by the German advance. Clearly, it was no longer possible for him to deal with everything himself, and he was obliged to find people with a scientific or technical background who could share some of his responsibilities, even if they were engaged elsewhere. For example, Camille Gutton, later to become the first PTT Director of the LNR, was occupied with the electrification of a barbed wire fence near the German frontier, but he was brought back to work with Ferrié. Among those who worked at the Eiffel Tower, at the workshop in the Boulevard de Latour-Maubourg, or at the detached laboratory and telegraph station in Lyon, were Abraham, Latour, Mesny and Louis de Broglie, all of whom were present at the First URSI General Assembly in 1922; others included Jouaust, who was associated with the French URSI Committee for more than 20 years, Carbenay and engineers whose names are less well known outside France. The range of problems which Ferrié and his teams had to attack was very wide indeed and included, for example, the installation of radiotelegraphy and later radiotelephony equipment in aircraft, radio direction-finders, the provision of radio sets in the first tanks (with the help of Louis Renault), the manufacture of the first vacuum triodes in France and their incorporation in radio transmitters and receivers designed for operational use.

The End of the War

After the end of the War in 1918, it was no longer possible to retain large numbers of skilled scientists and engi-

neers on radio development work that was concerned primarily with military requirements. On the other hand, Ferrié believed that, in the future, the applications of radio science would have important beneficial consequences for society in general, and that it would be desirable to redeploy at least some of those who were working for him. It was thanks to the advocacy of Ferrié that the decision was taken to create the Central Wireless Telegraphy Laboratory, under the direction of Jouaust and later Mesny, which in 1926 became the Laboratoire National de Radioélectricité.

During the War, the Eiffel Tower station had been used entirely for military radiotelegraphic communications, but some early tests on short-distance and even trans-Atlantic radiotelephony had been carried out. With the end of the War, Ferrié became interested in the possibility of using the station for the broadcasting of news bulletins and music. Once the main technical problems had been resolved, a small soundproofed studio was added to the existing installation at the beginning of 1922. A reminder of this early phase in the history of broadcasting in France can be seen in the office of at least one former officer of URSI; this is a photograph of Ferrié, accompanied by Yvonne Printemps and Sacha Guitry, in the Eiffel Tower studio during a broadcast in 1922.

Ferrié and URSI

A reference was made earlier to the Conference, held in Paris in 1912, at which the decision was made to create the BIH. A second important result of this Conference, which ultimately led to the creation of URSI, was that it brought together Robert Goldschmidt from Brussels, and Karl Schmidt from Halle in Germany. Both were already actively engaged in early experiments in radiotelegraphy and, without doubt, they were aware of the need for closer collaboration in their work across the frontiers of Europe. A happy consequence of this meeting was that, a year later in Brussels, Goldschmidt convened the first meeting of the International Commission on Scientific Wireless Telegraphy. Ferrié was a member of the Commission, as were several other active experimenters from Austria, Belgium, France, Germany, Italy, the Netherlands and the United Kingdom. In 1914 the Commission met again, and the members agreed to participate in several programmes of observation which were to be carried out on a cooperative basis, but alas the outbreak of World War I a few months later prevented these plans from developing.

The concept of the need to encourage international cooperation in radio science, which had led to the creation of the

Commission in 1913, survived the years of war; indeed, it was soon to be extended to other branches of science when the Academies of Science decided to create the International Research Council. In 1919, the Council held its inaugural meeting in Brussels, and it was on this occasion that the first four International Scientific Unions were established: URSI, and the Unions on Astronomy, Chemistry, and Geophysics. There can be little doubt that Ferrié's outstanding reputation as a pioneer in the development of radiocommunications, as well as his interest in other branches of radio science, led to his election as the Founder President of URSI.

I URSI Assembly, 1922

Goldschmidt, who had been convener and Secretary of the pre-war Commission, was elected Secretary General of URSI which, at that time was called the International Union on Scientific Radiotelegraphy. Following consultations between Ferrié and Goldschmidt, it was decided to convene the First General Assembly of the Union in Brussels in 1922. Unlike the 1913 Commission, the members of the new Union were National Committees, and not individual scientists. At the 1922 Assembly, representatives from Belgium, France, Italy, Norway, UK and USA were present, and it was known that several other countries were creating committees which would adhere later.

Apart from the discussion and formal approval of the Statutes, the main business of the Assembly was to decide how to subdivide the whole field of radio science so that attention could be focused on the most important groups of problems. Ferrié had very well-defined ideas on this and, at the opening of the discussion, he expressed the opinion that the principal questions requiring study were:

- the measurement of electromagnetic field-strengths and their variations;
- the variations in the bearings given by radio direction-finders;
- atmospherics and other disturbances;
- measurement techniques.

He proposed that the first two topics mentioned should be studied together in a 'Commission on the Propagation of Radio Waves' but, after some discussion, it was agreed that the Commission should include two Sub-Commissions, one for each topic.

Ferrié had already had close contacts over many years with the engineers and others who were responsible for the

actual operation of radiotelegraph stations. Without doubt, he had been able to profit from the opinions and the practical experience of such people, and it was probably this which led him to propose the creation of a fourth Commission, whose task would be to collect useful information from radio operators, and also from the amateurs who, in 1922, had already conducted trans-Atlantic experiments on frequencies of about 1.5 MHz.

Ferrié's proposals were accepted, with the proviso that the measurements Commission should be placed at the top of the list in view of the possibility of obtaining government support for work concerned with standardisation.

Thus the URSI Commissions established in 1922 were concerned with:

(i) Measurements and Standards;
(ii) Propagation of Radio Waves:
  (a) Field Strength,
  (b) Radio-goniometry;
(iii) Atmospherics;
(iv) Liaison with Operators and Amateurs.

During the 60 years that have gone by since these initial decisions on the internal structure of URSI were taken, radio science has greatly changed, but there is little room for criticism of Ferrié's ideas. The present Commissions A and E correspond closely to Commissions (i) and (iii) respectively. However, the complexity of the problems associated with the propagation of radio waves could not have been foreseen in 1922 and, in place of Commission (ii), the present Commissions B, F, G and H have since been created to deal with particular aspects of this vast subject.

Although Commission (iv) no longer exists as such, this certainly does not imply that URSI has ceased to take any interest in the practical experience gained by the organisations that are responsible for the operation of the world network of radiocommunication systems. For many years, URSI has kept in close touch with the International Telecommunication Union, and has cooperated very actively with its technical organs: the International Radio Consultative Committee and the International Telegraph and Telephone Consultative Committee. The URSI-CCIR-CCITT Liaison Committee coordinates the relations with the two organisations and ensures that the most appropriate contacts are established; radio scientists from nearly all of URSI Commissions play some rôle in one or more of the various CCIR Study Groups. The present Chairman of the URSI-CCIR-CCITT Liaison Committee is M. Marcel Thué, who had the

distinction of receiving the Gustave Ferrié Gold Medal in 1968 on the occasion of the centenary of Ferrié's birth.

It is interesting to note that the 1922 Assembly decided against creating a Commission on electronic vacuum tubes because, as Ferrié remarked, "such studies would have industrial "implications which would be out of place in the Union".However during the interval between the I and II URSI Assemblies, it became clear that URSI could not completely ignore the many electronic devices that were necessarily incorporated in the circuits used in all radiocommunication equipment. In 1927, Balth. van der Pol proposed the creation of a fifth Commission for the study of such questions as the theory of triodes, the general theory of circuits, and the application of new developments in the theory of complex functions to various radiocommunication devices. As a result, such a Commission was formed with the provisional title 'Commission on Oscillations', and with van der Pol as Chairman. At the 1928 Assembly, its name was changed to 'Commission on Radiophysics' on the suggestion of Charles Manneback, a future Treasurer and Honorary President of URSI. The present Commissions C and D can be regarded as the successors to the former Radiophysics Commission.

The Last Years

Up to the end of the War in 1918, Ferrié's primary responsibility had inevitably been the development of military radiocommunication systems of various kinds. In spite of this, he was always interested in the possibility of finding applications of radio science in other fields. Since 1909 he had been actively concerned with the use of radio time signals for the determination of longitude, and in consequence he had necessarily worked with astronomers and geophysicists. At the URSI Assembly in 1922, he recalled the progress of these investigations, and the related requirement for more accurate measurements of the velocity of propagation of radio waves, a question under discussion at that time. His call for closer links between radio scientists and those working in other disciplines resulted in the adoption of a proposal to establish relations between URSI and the Astronomical and Geophysical Unions.

At the Assemblies in 1927 and 1928, he emphasised again the need to encourage interdisciplinary studies in the search for solutions to the problems of radio wave propagation, especially in the high-frequency bands; he was particularly anxious that URSI should cooperate with the Commission for the Study of Sun-Earth Relations which had been created by the International Research Council, with Sydney Chapman as Chairman. Astronomers

and geophysicists everywhere are familiar with the Ursigram messages that are now broadcast regularly in several parts of the world; it was on the initiative of Ferrié that the first Ursigrams were broadcast from the Eiffel Tower in December 1928.

URSI's contacts with other Unions have been maintained over the 60 years since the first Assembly, and they have often been beneficial to both sides, especially in the stimulation of fresh approaches to research. Indeed some of the newer branches of astronomical and geophysical research, such as radio-astronomy, or the physics of the upper atmosphere and of the Earth's environment in space, had their origins in basic research carried out by radio scientists in their quest for improvements in radiocommunications.

Although Ferrié had gained a remarkable reputation as a scientist and as an administrator, it seems that he was not prepared to rest on his laurels, but rather that was always interested in looking ahead and encouraging future progress. Two of his interventions in discussions in URSI Commissions in 1931 illustrate this.

During a discussion on how best to make regular measurements on the ionosphere, Appleton proposed that the height of reflection should be measured at two separate frequencies: one for each of the two main layers. Ferrié suggested that the variation with height in the electron concentration in the ionosphere was probably continuous and, if so, it would be preferable to investigate the distribution by making step-by-step changes in the sounding frequency. His judgement was perfectly correct and, although regular measurements of this kind were hardly practicable in 1931, the first variable frequency ionospheric sounders were developed only a few years after his death, and are now in universal use.

In another Commission, Ferrié reported on the preparations for the international revision of longitudes, planned for 1933, in which radio time signals would be important. In reply to a question about why it was considered necessary to repeat measurements that had been made already in 1926, Ferrié pointed out that it would be desirable to organise such programmes at intervals of about seven years so that, eventually, they might make it possible to detect continental drift.

Finally, he was interested in the early development of television and, only four months before he died, he wrote to Jean Le Duc, one of his war-time assistants, about this new application of radio science.

IV URSI Assembly, 1931

The Opening Meeting of the URSI Assembly in Copenhagen in 1931 provided an occasion for the Union to express formally its recognition of the contributions that Ferrié had made in guiding it through the first nine years of its existence. After presenting his Report to the Assembly, the Secretary General addressed the President on behalf of the Union and its members (see Annex) and handed over to him a bronze medal, which has since come into the possession of the URSI Secretariat. The medal bears the very characteristic profile of Ferrié, and it shows also the outline of the upper sections of the Eiffel Tower, including the supports for the great 6-wire fan-shaped antenna, which had played such an important part in his career, during peace and war, over a period of more than 30 years. The reverse of the medal carries the inscription:

"L'Union Radio-Scientifique Internationale
reconnaissante à son éminent Président".

Epilogue

Ferrié was only 63 years old when he died after a short illness early in 1932. In Paris, he is commemorated by a monument in the Champ-de-Mars in the shadow of the Eiffel Tower, and by the nearby Avenue du Général Ferrié.

In the introduction to his survey of Ferrié's career, Georges Petitjean quotes some lines from Alfred de Lamartine:

"L'homme n'est bien mort que quand tous ceux qui
"l'ont connu et aimé sur la Terre se sont à leur
"tour couchés dans le tombeau....Jusque-là, l'homme
"vit encore un peu dans la mémoire de ceux qui
"survivent".

This sentiment may, perhaps, be rather too pessimistic for, even after the disappearance of the last of his contemporaries, so long as URSI survives, Gustave Ferrié will 'still live a little' in the memory of our Union.

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29 October 1982

ANNEX

Remarks of the Secretary General at the Opening Meeting of the URSI General Assembly, 28 May 1931

Mr. President,

I have one further duty to fulfil; this is to express to you, on behalf of all the National Committees and all the members of URSI, our warm and sincere congratulations on the exceptional distinction that has been conferred on you by the French Government in designating you as 'General without age limit'.

The eminent personalities who make up our Union were happy to learn of this formal expression of the high esteem in which your great country holds one of its most distinguished men of science of whom it is legitimately proud.

No one knows better than those who take part in our deliberations that the esteem which the general public has for the leaders in the development of radio science is due, in large measure, to you. In this branch of science, one of the most remarkable achievements of our time and whose benefits to humanity can not yet be assessed, you have been from its origins, and you remain now more than ever, one of its most distinguished workers. Given that URSI is devoted to the study and development of radio science at international level, the Union has had the good fortune to find in you the experienced and reliable guide who was indispensable to it. We are conscious of the debt that we owe to you for your outstanding cooperation and for the attention that you give to our activities, and today we would ask you to accept this expression of our most sincere gratitude and of our deep and respectful regard for you.

This medal, the work of a talented artist, reproduces your features which are already so well known to us all. May I ask you to accept it as a permanent reminder of our respect for the exceptional personality whom we honour most highly.

6TH SUMMER SYMPOSIUM ON CIRCUIT THEORY - SSCT 82

Note by Secretary General: A brief report on this Symposium, written by Prof. F.L.H.M. Stumpers, appeared in *URSI Information Bulletin* No 222 (September 1982). The following article which has been forwarded by the Chairman of the Organizing Committee of SSCT 82 gives more details.

The 6th Summer Symposium took place from 12 to 16 July 1982 in Prague. The Symposium was organized by the Institute of Radio Engineering and Electronics of the Czechoslovak Academy of Sciences under the auspices of URSI Commission C on Signals and Systems and the Czechoslovak URSI Committee.

The Symposium was a continuation of Symposia and Summer Schools held in 1965, 1968, 1971, 1974 and 1977. At present SSCT is the Symposium on Circuit Theory with the longest tradition in Europe. The Symposium had three sections: 1) Discrete Signal Processing; 2) Active and Non-conventional Analog Filters; 3) Communication Circuits and Systems. The following invited lectures were presented at the Symposium.

Benedetto, S. (Italy): Optimization and Performance Evaluation of Digital Satellite Transmission Systems.

Boite, R., Leich, H. (Belgium): A Study of the Noise Performances of Digital Recursive Filters.

Del Re, E. (Italy): Performance of Non-FFT Transmultiplexer Implementations.

Emiliani, P.L. (Italy): Applications of Digital Speech Processing to the Aids for the Sight and Hearing Impaired.

Frigyes, I. (Hungary): Recent Trends in Digital Microwave Communication Systems.

Gensel, J. (German D.R.): On Active Filters Using Electromechanical Resonators.

Jaroslavski, L.P. (USSR): Discrete Representation of Signals and Transforms for Digital Processing of Pictures.

Kroupa, V.F. (Czechoslovakia): Digital Systems for Frequency Stability Measurements.

Kuchar, A. (Czechoslovakia): Optical Fiber Communications - The State of Art.

Lüder, E. (FR of Germany): Equivalent Digital Filters and Some of their Applications.

Moss, P., Trezzi, M., Ramatowski, M. (Czechoslovakia): The New Possibilities in the Realisation of Adaptable Filters by 'SC'-Technology.

Nussbaumer, H.J. (Switzerland): Fast Polynomial Transform Algorithms for Real Time Signal Processing Applications.

Simsa, J. (Czechoslovakia): Coherent Demodulation of MPSK Signals - Problem of Carrier Recovery.

Spiegel, P. (German D.R.): Active Frequency-Filters Using Standard Building-Blocks.

Stursa, J., Vich, R. (Czechoslovakia): Problems of Digital Filter Simulation.

Professor F.L.H.M. Stumpers was an honorary guest of the Symposium.

In addition to invited lectures, 26 short contributions were presented in the section on 'Discrete Signal Processing', 44 in the section on 'Active and Non-conventional Analog Filters', and 21 in the section on 'Communication Circuits and Systems'. The main contributions, as well as the short ones, achieved high standard of quality and were concerned with problems which are presently of great interest to scientists in the particular fields. All lectures were presented in English and were followed by lively discussions. There were 205 participants at the Symposium: 96 from Czechoslovakia and 109 from abroad (Belgium 2, Brazil 1, Bulgaria 4, Canada 2, Cuba 3, Egypt 2, FR of Germany 9, France 2, German D.R. 10, Greece 1, Hungary 38, Italy 12, Poland 5, Rumania 2, Switzerland 1, The Netherlands 2, Turkey 1, United Kingdom 2, USSR 4, Yugoslavia 4).

During the Symposium a workshop on Signal Processing in Medical Applications was organized, in which P.L. Emiliani presented an invited paper, and a unique film on 'Cochlear mechanics' was shown by Czechoslovak scientists. Another workshop, concerned with 'Phase-lock loop techniques', was accompanied by a small exhibition of measuring equipment intended to be used in the field of precise time and frequency measurements. The Symposium and the Welcome Party took place in the pleasant interior of the modern Palace of Culture of Prague. Texts of all invited papers and short contributions have been published in a two-volume Proceedings, which can be obtained from Artia,

Ve Smeckách 30, 111 27 Praha 1, Czechoslovakia.

V. Cizek

8TH EUROPEAN CONFERENCE ON OPTICAL COMMUNICATION

This Conference, which was held from 21 to 24 September 1982 in Cannes (France), belongs to the series of conferences on optical fibre communication started in London in 1975, and followed by Paris (1976), Munich (1977), Genoa (1978), Amsterdam (1979), York (1980) and Copenhagen (1981). It has become a major forum for the presentation of achievements and exchange of ideas in the field of fibre technology and applications. The 9th Conference will be held in Geneva, Siwtzerland, in October 1983.

This Conference series has a Management Committee confined to the Convention of National Societies of Electrical Engineers of Western Europe (EUREL).

The 8th Conference was organized by the Société des Electriciens, des Electroniciens et des Radioélectriciens (SEE) and the Groupement des Industries Electroniques de France (GIEL). The Chairman of the Technical Programme Committee was Dr. R. Bouillie (CNET).

The 8th European Conference on Optical Communication gathered up to 1,000 participants from nearly 30 countries in the Nouveau Palais des Festivals et des Congrès at the Boulevard de la Croisette, which is endowed with very convenient technical arrangements. A substantial volume of digests (650 pages) was handed to the participants at the beginning of the Conference, and six papers were distributed later.

The programme of the Conference contained the following Sessions: Opening session; Invited Papers; Technology (1, 2); Fibre Properties (1, 2, 3); Cables; Lasers (1, 2); Integrated Optics; Active Components (1, 2); Passive Components (1, 2); Systems (1, 2); Applications (1, 2); Closing Ceremony. All together about 90 papers were presented, including 8 invited papers and 6 late contributions. In the two poster sessions 29 papers were shown.

The titles of the invited papers reflect well the highlights of the Conference:

G.J. Koel (Philips, Eindhoven): Technical and economical aspects of the different fibre fabrication technologies.

F. Tosco (CSELT, Torino): Optical fibre communication in the 0,8 - 0,9 /um wavelength region: applications and perspectives.

C.J. Lilly (British Telecomm., London): The state of the art and applications of optical fibre systems operating at the longer wavelengths of 1,3 - 1,6 /um.

M. Treheux (CNET, Lannion): Applications of optical fibre systems to the subscribers networks.

J. Arnaud (Université de Limoges): Report on the Workshop on Theoretical Studies.

T. Sueta (Osaka University): Recent progress in integrated optics.

G. Winzer (Siemens, München): Wavelength division multiplexing status and trends.

S. Personick (TRW, Redondo Beach): Applications of fibre optics to local area networks.

During the Conference, an exhibition was organized showing recent progress in French technology and systems.

A. Smolinski

First International School for Space Simulation (ISSS)

The First International School for Space Simulation (ISSS) was held in Kyoto, Japan, from 1 to 12 November 1982. This School was intended to promote numerical simulation techniques in the field of space plasma research. The School was attended by approximately 110 participants among which about 30 were students or junior scientists. Participants were mainly coming from Japan (about 60) and the United States (about 40). Other Asian countries provided 4 participants and Europe 8.

Approximately 55 oral conferences (between 1 and $1^{1/2}$ hr duration) were given and 15 posters were presented during night sessions. Oral presentations belonged mainly to three categories:

- Recent space experimental data (10);
- Recent theoretical work relevant to crucial problems in magnetospheric physics: ionosphere-magnetosphere coupling, magnetic reconnection, auroral kilometric radiation, nonlinear wave-particle interactions (about 10);
- Results of simulation experiments (about 35) covering the field of microphysics (double-layers, nonlinear wave-particle interactions), meso-scale physics (reconnection, tearing mode, Kelvin-Helmholtz instabilities, collisionless shocks), or large-scale plasma dynamics in the Earth's environment (solar wind structure and perturbations, magnetopause formation, magnetospheric convection and coupling between the ionosphere and the magnetosphere).

The very open-minded discussions which took place among people coming from these three horizons were very profitable to everyone. This experience will be renewed and a second ISSS will probably be held within two years.

The Conference was nicely organized in a Seminar House near Kyoto and the efficiency of the Japanese Local Committee must be acknowledged.

URSI contributed through a grant which allowed two European scientists to attend this Conference.

R. Gendrin
Member of the Organizing
Committee of the 1st ISSS.

ANNOUNCEMENTS OF MEETINGS AND SYMPOSIA

5th Symposium and Technical Exhibition on Electromagnetic Compatibility, Zurich, 8-10 March 1983

"Electromagnetic compatibility (EMC) is the ability of an elec-"tric device to operate satisfactorily within its electro-"magnetic environment without causing inacceptable interference "to other electric systems". The EMC discipline may thus be viewed as a sort of protection of the electromagnetic environment.

The Symposium and Technical Exhibition on Electromagnetic Compatibility is organized every odd year and attained in 1981, with 500 attendees and 25 exhibitors, a record-breaking parti-

cipation. The "EMC 1983" will be organized under the auspices of the Director-General of the Swiss PTT, Mr. R. Trachsel, by the Institute for Communication Technology of the Swiss Federal Institute of Technology (ETHZ) in Zurich. It is sponsored by the Association of Swiss Electrotechnicians (SEV/ASE) and co-sponsored by URSI. It is presided by Prof. P. Leuthold (Zurich). The Organizing Chairman is Dr. T. Dvorak (Zurich), the technical programme committee is chaired by Prof.Dr. R.M. Showers (USA). The cooperation of renowned scientists and professional organizations from all over the world promises again a successful conference.

Over 100 papers originating from nearly 20 countries will be delivered in 18 sessions entitled: Environment, Interference models, Propagation and wave coupling, NEMP (nuclear electromagnetic pulse), Biological effects, Power electronics, NEMP simulation, Immunity, Suppression techniques, Transmission line coupling, Shielding and grounding, EMC standards, Non-homogeneous fields, Measurements, EMC computer programmes, EMI in microelectronics, Spectrum management, EMC analysis and design. A technical exhibition and a number of workshops round off the technical programme.

As usual, the symposium will review the current status and future trends of the EMC science. The workshops, organized on a question-answer basis in direct contact with the speakers, provide an introduction to newcomers, and respond to the needs of practicing engineers. The exhibition, which will also be open to the non-registered public, will introduce modern measuring techniques, new technologies in materials and components, as well as EMC training programmes. The full text of all conference papers will be made available in the conference proceedings: "EMC 1983".

Copies of the Preliminary Programme with registration forms and further information concerning the symposium and technical exhibition may be obtained from:

Dr. T. Dvorak,
ETH Zentrum-IKT,
CH - 8092 Zurich,
Switzerland.

Commission E Meeting in Zurich

7 March 1983

URSI is a cooperating society of the Zurich Symposium and Exhibition on Electromagnetic Compatibility (8-10 March 1983), and several of our members are involved as session organizers or speakers.

We therefore thought this a good occasion to have the following meetings in Zurich on 7 March 1983, in the ETHZ building, Râmistrasse 101 (within walking distance of the main railway station).

10 AM: Business Session of URSI Commission E

Agenda:

1) Representation of Commission E at
   a) IEEE-EMC Symposium, Washington 1983
   b) Tokyo EMC Symposium 1984
   c) Wroclaw Symposium (no definite date proposed as yet)
2) Commission E activities at the General Assembly of URSI in Florence, Italy, August/Sept. 1984
3) Reports from Working Groups, if available
4) Assistance to developing countries
5) Establishment of the new Working Group on Lasting effects of transients on equipment performance.

Official Members not able to participate themselves may be represented by a colleague. Please let us know in advance.

14 PM: Open Workshop on the Lasting effects of transients on equipment performance, sponsored by URSI Commission E

Organizer: Prof. S. Lundquist
Chairman : Prof. F.L.H.M. Stumpers

1. S. Lundquist: A review of natural and man-made transients.
2. J. Wiesinger: Propagation and interaction-classification of EMT with respect to their lasting effects on telecommunication equipment.
3. Experts from several countries have been invited to participate in the discussion, but no definite commitment has yet been made. If there are others who intend to make a contribution, they are requested to write to

Professor F.L. Stumpers, Elzentlaan 11, Eindhoven 5611 LG, The Netherlands.

4. General discussion on the detailed task of the Working Group: Identification of problems; Measures of protection; Testing standards for lightning and NEMP control equipment; Expected reliability; Areas of research, National and international activities.

5. Closing of the session.

S. Lundquist, Chairman URSI Comm.E

F.L.H.M. Stumpers, Vice-Chairman URSI Comm. E

Bioelectromagnetics Society

5th Annual Meeting

The BEMS will hold its 5th Annual Meeting from 12 to 16 June 1983 in Boulder, Colorado. All sessions will be held at the University of Colorado in Boulder. Local arrangements for the meeting will be made by Drs F. Barnes and H. Wachtel of the University of Colorado. The Technical Programme Committee will be chaired by A.W. Guy, Vice-President/President-Elect.

CALL FOR PAPERS

Original papers are being solicited, for presentation in English either from the platform or via poster, on the interaction of electromagnetic energy (from zero Hertz through the visible light frequencies) and of acoustic energy with biological systems. Areas of interest include, but are not limited to:

Behavioral effects; Physiological effects; Endocrine effects; Developmental effects; Dielectric properties of biological material; Interactive mechanisms; Instrumentation;Hyperthermia; Field perturbations; Cellular and ultra-structural effects; Electric field effects; Genetic effects; Exposure systems; Dosimetry; Diagnostic and therapeutic applications.

Authors wishing to present papers should apply to:

Bioelectromagnetics Society,
1 Bank Street, Suite 307,
Gaithersburg, Maryland 20878, USA

and request a form for submission of an abstract. Abstracts submitted by non-members must be sponsored by at least one BEMS member. The deadline for submission of abstracts is 1 February 1983.

IEEE 1983 International Symposium on Electromagnetic Compatibility

This Symposium will be held from 23 to 25 August 1983 in Washington, D.C. at the Hyatt Regency Crystal City, and will be the Silver Anniversary celebration for the EMC Society. The theme of the Symposium will be "A Quarter Century of EMC rogress". The Symposium will focus on the current state-of-art after a quarter century of EMC Progress and look into the future to see where the efforts should be directed.Particular emphasis will be given to the systems approach to EMC which involves reduction of undesired emanations and the reduction of the susceptibility of electronic devices and systems.Authors are invited to submit original, unpublished papers in all areas of EMC theory and practice.

Further information from:

William G. Duff,
Technical Programme Chairman,
Atlantic Research Corporation,
5390 Cherokee Avenue,
Alexandria, VA 22314, USA.

9th European Conference on Optical Communication, ECOC 83

This meeting will be held from 23-26 October 1983 in Geneva, Switzerland. ECOC is an annual conference and is intended to provide the major international forum for the exchange of information on the progress of research and development in optical communication.

Topics of the meeting will be basic research, components technology, system engineering as well as novel concepts and applications.

Emphasis will be put on original contributions for oral presentation and poster sessions. A limited number of invited papers will review important developments and show the state of the art for the different topics.

At the session for post deadline papers the very latest ideas and results will be presented.

Conference language will be English.

ECOC 83 is organized by the Swiss Electrotechnical Association, Zurich in cooperation with the Member Companies of Pro Telecom, Switzerland, the Swiss PTT, and the Swiss Federal Institutes of Technology, Zurich and Lausanne. The meeting is sponsored by the Convention of National Societies of Electrical Engineers of Western Europe (EUREL), in liaison with the Institute of Electrical and Electronics Engineers (IEEE Region 8), the Optical Society of America, the Institute of Electronics and Communication Engineers of Japan, the Institute of Electrical Engineers of Japan, the International Union of Radio Science (URSI), and the Groupement de l'Electronique Suisse Occidental. The deadline for the submission of papers is 30 April 1983. For detailed information on the conference and on the preparation of abstracts, contact the conference secretary:

A. Sollberger,
Institute for Applied Physics,
Swiss Federal Institute of Technology,
CH - 8093 Zurich, Switzerland.

News From Member Committees

UNITED KINGDOM: Astronomer Royal: Prof. Graham Smith

It has been announced in London that H.M. the Queen has appointed Professor Graham Smith to the position of Astronomer Royal. Prof. Smith is Director of the Radioastronomy Laboratories at Jodrell Bank, and Professor of Astronomy at the University of Manchester. For several years, he was Chairman of the Inter-Union Commission on the Allocation of Frequencies for Radio Astronomy and Space Science during the preparations for the World Administrative Radio Conference in 1979. His predecessor as Astronomer Royal was Sir Martin Ryle, who was awarded the Balth. van der Pol Gold Medal at the URSI General Assembly in Tokyo in 1963.

Prof. Smith is the 13th Astronomer Royal, and it is interesting to recall that the first holder of the position was John Flamsteed, who encouraged Charles II to build the Royal Observatory at Greenwich in 1675. Flamsteed's main interest was in making accurate observations of stellar transits across the Greenwich meridian for use in maritime navigation. The story is told that this programme had to be interrupted from time to time, to Flamsteed's annoyance, so that observations of the Moon could be made for Isaac Newton who was developing his gravitational theory. Like Flamsteed, Prof. Smith is a former Director of the Royal Greenwich Observatory.

The second Astronomer Royal was Edmond Halley, whose comet has recently been sighted on its periodic return towards the Sun. It was he who finally persuaded Newton to publish the *Principia*; although the work did not appear until 1687, it contained the results on gravity that had been largely completed by Newton 20 years earlier.

C.M.M.

Books Published by URSI Personalities

J.R. MOSIG and F.E. GARDIOL (President, Swiss URSI Committee)

A Dynamical Radiation Model for Microstrip Structures, Advances in Electronics and Electron Physics, vol.59, Academic Press, 1982/83.

James R. WAIT (former Secretary of the US URSI Committee)

Geo-Electromagnetism, 280 pages, Academic Press, 1982.

URSI Awards 1984

The Balth. van der Pol and the J.H. Dellinger Gold Medals, and the Appleton Prize, will be awarded at the Florence General Assembly of URSI, to be held in August 1984. Nominations should be sent to the URSI Secretariat not later than 1 July 1983. The Rules governing the Awards have been published in *URSI Information Bulletin* No 212 (March 1980). They remain valid for 1984, and will be reprinted in the March 1983 issue of the Bulletin. In a forthcoming letter, Member Committees and Chairmen and Vice-Chairmen of Commissions will be formally invited to propose candidates.

Marconi International Fellowship

The Marconi International Fellowship invites nominations of individuals whose work in the fields of communication science and technology exemplifies the technical creativity and concern for human welfare of Guglielmo Marconi.

The tenth Fellowship award of $35,000 will be presented in 1984. Deadline for nominations is 15 April 1983. Final selection of the recipient will be made in October 1983.

For details, contact Dr. G. Bugliarello, Secretary, 333 Jay Street, Brooklyn, N.Y. 11201, USA.

List of Future Symposia and Meetings

Note: Events marked by an asterisk are sponsored or co-sponsored by URSI.

Beacon Satellite Studies of the Earth's Environment, and Workshop on Beacon Techniques and Applications, 3-11 February 1983, New Delhi, India.

Contact Address: Dr. R. Leitinger,
Karl-Franzens-Universität Graz,
Institut für Meteorologie und Geophysik,
Halbärthgasse 1,
A-8010 Graz, Austria.

Chapman Conference on Waves in Magnetospheric Plasmas,+
Kona Coast, Hawaii, 7-11 February 1983.

Contact Address:

Prof. R.L. Dowden,
Department of Physics,
University of Otago,
P.O.Box 56,
Dunedin, New Zealand.

or

Dr. B.J. Fraser,
Department of Physics,
University of Newcastle,
Newcastle, 2308 NSW,
Australia.

5th Symposium and Technical Exhibition on Electromagnetic Compatibility+, Zurich, Switzerland, 8-10 March 1983.

Contact Address: Dr. T. Dvorak,
ETH Zentrum-IKT,
CH-8092 Zurich, Switzerland.

IEE Conference on Antennas and Propagation+,
Norwich, United Kingdom, 12-15 April 1983.

Contact Address: ICAP 83 Secretariat,
Conference Services,
The Institution of Electrical Engineers,
Savoy Place,
London WC2R OBL, United Kingdom.

MAP Workshop on Technical Aspects of MST Radar+,
Urbana, Illinois, USA, May 1983.

Contact Address: Prof. S.A. Bowhill,
Aeronomy Laboratory,
University of Illinois,
Urbana, Ill. 61801,
USA.

URSI Commission F Symposium on Wave Propagation and Remote Sensing+, Louvain-la-Neuve, Belgium, 9-15 June 1983.

Contact Address: Secretariat URSI Comm.F 1983 Symposium,
Laboratoire de Télécommunications, UCL,
Bâtiment Maxwell,
B-1348 Louvain-la-Neuve,
Belgium.

5th Annual Meeting - Bioelectromagnetics Society,
Boulder, Colorado, 12-16 June 1983.

Contact Address: Bioelectromagnetics Society,
1 Bank Street, Suite 307,
Gaithersburg, Maryland 20878,
USA.

4th International Conference on Integrated Optics - Optical Fiber Communication, IOOC'83+, Tokyo, Japan, 27-30 June 1983.

Contact Address: Secretariat IOOC'83,
c/o Business Centre for Academic Societies,
2-4-16 Yayoi, Bunkyo-ku,
113 Tokyo, Japan.

XVIII General Assembly of IUGG,
Hamburg, Fed. Rep. of Germany, 15-27 August 1983.

Contact Address: Dr. W. Zahel,
Institut für Meereskunde,
der Universität Hamburg,
Heimhuderstrasse 71,
2000 Hamburg 13, Fed. Rep. of Germany.

Symposium on Remote Sensing for Climate Studies,
during the IUGG General Assembly in Hamburg, August 1983.

Contact Address: Mr. S. Ruttenberg,
Secretary General, IAMAP,
National Centre for Atmospheric Research,
P.O.Box 1470,
Boulder, Colorado 80302, USA.

Symposium on Ionospheric Modification,+
during the IUGG General Assembly in Hamburg, August 1983.

Contact Address: Prof. N. Fukushima,
Secretary General, IAGA,
Geophysical Institute,
University of Tokyo,
Bunkyo-ku, 113 Tokyo, Japan.

Symposium on Electrodynamics of the Polar Ionosphere and Magnetosphere+, during the IUGG General Assembly in Hamburg, August 1983.

Contact Address: Prof. N. Fukushima,
Secretary General, IAGA.

Joint IAMAP/IAGA Symposium on Middle Atmosphere Sciences (MAS), During the IUGG General Assembly in Hamburg, 20-26 August 1983.

Contact Address:

Dr. A. Ebel,
Institut für Geophysik und Meteorologie,
Universität Köln,
D-5000 Köln 41, FRG.

or

Dr. P.C. Simon,
Institut d'Aéronomie Spatiale,
3 avenue Circulaire,
B-1180 Brussels, Belgium.

URSI Symposium on Electromagnetic Theory,+
Santiago de Compostella, Spain, 23-26 August 1983.

Contact Address: Dr. J.L. Sebastian,
Dpt° de Electricidad y Electronica,
Facultad de Ciencias Fisicas,
Ciudad Universitaria,
Madrid 3, Spain.

IEEE 1983 International Symposium on Electromagnetic Compatibility+, Washington, D.C., USA, 23-25 August 1983.

Contact Address: Dr. W.G. Duff,
Technical Programme Chairman,
Atlantic Research Corporation,
5390 Cherokee Avenue,
Alexandria, VA 22314, USA.

ICPIG-XVI - International Conference on Phenomena in Ionised Gases+, Düsseldorf, Fed.Rep. of Germany, 29 Aug.-3 Sept.1983.

Contact Address: Organizing Committee ICPIG-XVI,
c/o Prof; K. Suchy,
Institut für Theoretische Physik,
Universität Düsseldorf,
D - 4000 Düsseldorf 1, FRG.

Workshop on the International Reference Ionosphere,+
Bulgaria, 30 August - 3 September 1983.

Contact Address: Prof. K. Rawer,
Herrenstrasse 43,
D-7801 March-Hugstetten, FRG.

Symposium on Measurement and Processing for Indirect Imaging+,
Sydney, Australia, 30 August - 1 September 1983.

Contact Address: Prof. R.H. Frater,
CSIRO Division of Radiophysics,
P.O.Box 76,
Epping, N.S.W., 2121 Australia.

13th European Microwave Conference+,
Nürnberg, Fed. Rep. of Germany, 5-8 September 1983.

Contact Address: Prof. Dr. H. Groll,
Technische Universität München,
Arcisstrasse 21,
D-8000 München 2, FRG.

9th European Conference on Optical Communication[+],
Geneva, Switzerland, 23-26 October 1983.

Contact Address: Conference Secretary ECOC 83,
A. Sollberger,
Institute for Applied Physics,
Swiss Federal Institute of Technology,
CH-8093 Zurich, Switzerland.

4th World Telecommunication Forum Technical Symposium[+],
Geneva, Switzerland, 29 October - 1 November 1983.

Contact Address: Forum 83,
International Telecommunication Union,
Place des Nations,
CH-1211 Geneva 20, Switzerland.

8th International Conference on Infrared and mm Waves[+],
Miami Beach, USA, 12-17 December 1983.

Contact Address: Dr. K.J. Button,
MIT, Francis Bitter National Magnet Laboratory,
170 Albany Street,
Cambridge, Mass. 02139, USA.

Symposium on Microwave Signatures in Remote Sensing[+],
Toulouse, France, 16-20 January 1984.

Contact Address:

Dr. E. Schanda,
Institute of Applied Physics,
University of Berne,
Sidlerstrasse 5,
CH-3012 Berne, Switzerland.

or

Prof. R.K. Moore,
Remote Sensing Laboratory,
The University of Kansas,
2291 Irving Hill Drive,C.West,
Lawrence, Kansas 66045, USA.

Symposium on Equatorial Aeronomy[+],
Hong Kong, 17-29 March 1984.

Contact Address: Dr. S. Matsushita,
National Center for Atmospheric Research,
High Altitude Observatory,
P.O.Box 3000,
Boulder, Colorado 80307, USA.

7th International Symposium on Electromagnetic Compatibility[+],
Wrocław, Poland, June 1984.

Contact Address: Prof. R.G. Strużak,
EMC Symposium,
Box 2141,
51-645 Wrocław 12, Poland.

EMC '84 - International Symposium on Electromagnetic Compatibility[+], Tokyo, Japan, 16-18 October 1984.

Contact Address: Prof. T. Takagi,
Tohoku University,
Department of Communications,
Aramaki, Aoba, Sendai, Japan.

9th International Conference on Infrared and mm Waves[+],
Takarazuka City, Japan, 24-29 October 1984.

Contact Address: Dr. K.J. Button,
MIT, Francis Bitter National Magnet Laboratory,
170 Albany Street,
Cambridge, Mass. 02139, USA.

Note: The following meetings are planned, but details are not yet available.

Symposium on Millimetre and Submillimetre Radio Astronomy[+],
Granada, Spain, 1984.

Symposium on Astronomy with VLBI[+],
Bologna, Italy, June 1984.

International MAP Symposium,
Kyoto, Japan, Fall 1984.

Symposium on the Results of the International Magnetospheric Study (IMS).

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Note: An alphabetical index of names, with addresses and page references, is reproduced at the back of this Bulletin.

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