

SYMPOSIUM DE MUNICH

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Address delivered by
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I. This Symposium which we have organized at Munich accords entirely with the general decisions taken by the Executive Committee and the Council of the Union, assembled in Paris last month: that is to raise the number of partial reunions whose object is to study some definite problem, and thereby to relieve the General Assemblies, at which many questions of general organization and administration must be discussed—in the course of which room must be left for free discussion.

That the Symposium at Florence last year, was a great success no one doubts. A Symposium on Gravimetry will take place in Paris next September. Then for next year is proposed another reunion, to continue the work of adjustment of the European Levelling network. To this we shall invite some of our colleagues of the Association of Physical Oceanography, in order to study with them problems arising from the determination of mean sea level by the various maregraphs operating in the area of the network.

We can indeed claim that, without waiting for the recommendations of the Union, for a considerable time we have endeavoured to give to our General Assemblies a character very different from that of a Congress—during which countless ‘communications’ are presented, which are heard by few and later published at great expense and little read.

Thus the International Association of Geodesy has indeed been in advance of these Union recommendations. I think it proper to draw attention to this fact at the opening of our present reunion.

II. Our reunion at Munich, while on a scale much smaller than that of a General Assembly, should not follow the pattern of a small Congress. We are not assembled here to listen to ‘communications’. Let us concern ourselves with those which have been prepared in advance and distributed amongst us all. Our object is constructive. We should take measures, of varying degrees of urgency, to build up an adjusted network of European Triangulation, which will constitute a second and closer approximation than that already made some years ago.

The second approximation should have a more scientific character than had its predecessor, *which performed the all-important work of attaining self-consistency and unification of conflicting results*. It should take account of the differences between Geoid and *used-ellipsoid*, which can be derived from results of the first approximation associated with the numerous, *if not ample*, astronomical stations observed at in Europe. Of these the synthesis has been made by Brigadier Bomford, who maintains it up to date.

Again, account must be taken of the improvements made in the network since the time of the first adjustment—and indeed of expected further

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improvements which Sub-Commission A may recommend, provided that these are not too long delayed.

We hope that the calculations undertaken may have high scientific value—even at the cost of some delay. This time we are not in so great a hurry, and we know that several years' delay (even ten) may elapse before we can reach a completely satisfactory result.

It is most important for us to plan our method of work in a form which will allow from time to time the introduction of improvements of the network, whilst also allowing work to begin without delay.

III. I will now recall in a few words, and, for reasons you understand, very discreetly, the conditions under which the calculations of 1948–51 were undertaken.

As we all know they were not undertaken at the instigation of the I.A.G. But the Association gave its guarantee in approaching each participating country, so that each would furnish the *best data available at that time*—without waiting for new observations but taking full account of most recently completed observations.

By means of this guarantee—and by means of some control of inspection of the calculations, which were carried out under the direction of Mr. Whitten, the best specialist on this subject—the I.A.G. gained partial communication of results, in the form of a comparison, good to 0".1, between adjusted geodetic coordinates and actual astronomical coordinates wherever available.

That was all—not much but sufficient to enable the I.A.G. to draw the contours of the geoid on the adjusted European system: and that is an essential element for the second approximation which we are now about to undertake.

The policy followed by the I.A.G. at that time has been criticized in several countries—especially those most to the east of Europe. The I.A.G. takes full responsibility for it. If she had not given her guarantee for the calculations undertaken, they would nonetheless have been made—perhaps with less precision—but the I.A.G. would not have had any of the results. Indeed the I.A.G. preferred not to know the conditions under which the calculations were undertaken. She possessed the means of obtaining certain results of a first adjustment, and she availed herself of them.

All that without doing any harm to any country, for, I repeat, the calculations would have been made all the same without her or even in spite of her. IV. The circumstances now are entirely different. It is now a case of initiative of the I.A.G. and of a purely scientific calculation, made with the full accord of each country whose net is included. The I.A.G. greatly hopes that the coordinates obtained in the course of this second calculation will not be kept secret by the nations, especially by those interested in the international problems of maritime and aerial navigation. She hopes that the network may extend as far as possible to the east of Europe, and so cover a great area.

She contemplates calculating isostatic reductions of all deviations of the vertical, and so to undertake for all Europe such a calculation as done for the U.S.A. by Hayford some fifty years ago. But that is still in the future and, in spite of all, some time ahead.

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V. For the immediate present I would emphasize now the points which your Bureau consider essential features of the work which you are now undertaking.

You have all received the Circular Letter of 20 February 1956, with the agenda of matters for discussion. This agenda was prepared in Munich by a commission comprising MM. BAESCHLIN, TARDI, KNEISSL and LEVALLOIS, and it has my approbation.

Most unfortunately our valued Secretary-General, Professor Pierre TARDI, recently fell seriously ill and, though now recovered, has not the permission of his doctors to be present here with us. He has organized this meeting with great care and forethought and is profoundly disappointed that he cannot attend it—in which I know you will all fully sympathize. We shall miss him greatly, both on professional and personal grounds. For myself, I feel bereft of a trusted support and I take this opportunity of acknowledging very important help in the preparation of this present address.

Let us now turn to the three sub-commissions.

Sub-Commission A will be presided over by Professor MARUSSI, who is Secretary of our Section 1, as well as General Reporter on Triangulation.

We cannot expect an entirely new network to be constructed in these few days at Munich. It should suffice that Professor MARUSSI collect all the documents communicated to him by the participating nations: and that he establish touch with those nations which are not represented at Munich and study in due course, at his leisure after return to Italy, the composition of the general network. That is the process already adopted for the levelling network—and I take this opportunity of recording the thanks of the I.A.G. to Dr. Ove SIMONSEN of Copenhagen for the extreme devotion which he has brought to the building of the Unified European Network of Levelling (U.E.N.L.) which will be essentially his work.

We may ask sub-commission A here in Munich to reach first conclusions, after due discussion, regarding

- (a) nations not represented at our reunion,
- (b) specific works considered of *primary urgency*, which should form the object of *resolutions* to be transmitted to the nations concerned by the I.A.G.

We must recognize that the work of the sub-commission should be a *continuous creation* and not simply the result of some hasty discussions here and now at Munich.

Sub-Commission B should lay down the principles of the *method* which should be followed in the adjustment. The Bureau recommends a method of division into national blocks, which should allow each participant (or a group of neighbouring participants) itself to effect an *internal* adjustment of its network: and to furnish merely the equations of liaison with neighbouring countries to the central organization necessary for the latter to proceed with the simultaneous adjustment.

This recommendation is based on the following reasons:

- (a) Only this method is practically feasible, because it divides the work among nations. The I.A.G. has not the means nor the money to

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undertake a complete simultaneous adjustment of European triangulation.

- (b) Only in this way will extension of the network to include nations, which do not participate from the beginning, be made.
- (c) This method alone can solve in a satisfactory way the question of secrecy, to which possibly some nations still attach importance.

The central calculating organization (still to be created) will not need full details of network coordinates. Such coordinates, once calculated within each network, can receive 'European adjustment corrections', as and when these are issued from the central organization. Each country will be free to decide whether to publish their definitive coordinates, or simply, as at present, the elements defining the relative deviations of the vertical.

Now this method will be very difficult to specify fully. We rely greatly in this matter on Professor GROSSMANN, one of the greatest exponents of the method of Least Squares. I would only suggest that these problems have complete mechanical analogues, which suggest—at least to some minds—less meticulous solutions of a practical kind.

Now, gentlemen, many large industrial organizations find need for a 'Research Section': and similarly we have framed Sub-Commission C to be our section for Theoretical Studies of the New Adjustment. It is under the competent presidency of Brigadier Hotine who is also President of Special Study Group No. 1 of our Association. I shall not adopt the role of prophet. We urgently look to Brigadier Hotine to present not only studies but also *some practical conclusions* regarding the items on his agenda. This reunion affords unusual opportunity for promoting new developments in a practical way, under the eyes of specialists. For this section also there should be continuous creation over a period of years, on foundations which may be laid this week.

I hope that Professors Marussi and Grossmann and Brigadier Hotine will find suitable occasions during the week for exchange of ideas as their several works develop: for the latter are not independent. This I know imposes work beyond the fully charged programme before us; and I can say in advance with confidence, how much the Association will be beholden to them.

VI. When our Munich reunion is over, the work which we have launched must be continued, in the cadre of I.A.G. organization, by its Special Study Groups.

Your Bureau proposes that SSG. No. 1, under Brigadier Hotine's presidency, continue and take account of our Munich discussions.

The Permanent Commission of the European triangulation adjustment is concerned with the European triangulation. It will continue to be presided over by Professor Kneissl and to comprise two sub-groups presided over by Professors Marussi and Grossmann, whose tasks will be to continue the work of the Munich sub-commissions A and B.

VII. There is plenty of work to be done and our time here is brief. Moreover, our benevolent hosts have made provision for various activities, all of which may be of the nature of 'adjustment' or 'compensation'—even when not of triangulation. I am sure that these will prove most attractive and

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stimulating. To deserve these we must be both industrious and prudent in the five working sessions. I beg Presidents of Sub-Commissions to use their fullest art to confine discussions to the most profitable lines, and to guard against *digressions*, which, though interesting, might well consume time which could not be made up. May I also crave the full cooperation of commission members in easing the task of their presidents?

I have full confidence that, when Saturday comes, we shall have a good measure of progress to record and useful resolutions for adoption.

Reports available

- K. ARNOLD: Über die strenge Ausgleichung des Europäischen Dreiecksnetzes mit besonderer Berücksichtigung des Einsatzes einer elektronischen Rechenmaschine.
- K. ARNOLD: Über die Verbesserung astronomischer Nivellements durch Auswertung von Schweremessungen.
- W. BAARDA: Some remarks on his earlier paper, 'Some remarks on the computation and adjustment of large systems of triangulation' (Rome 1954).
- F. BAESCHLIN: Eine Diskussionsfrage für die Beratungen der Europäischen Triangulationskommission resp. der Arbeitsgruppe Nr. 1.
- G. BOMFORD: Study Group No. 14 European Geoid. Interim Report Jan. 1956.
- G. BOMFORD: The readjustment of the European Triangulation, 1956.
- T. HONKASALO: International Standard Base Lines Measured with Light Interference for Unification of the Scale in I Order Triangulations.
- M. HOTINE: Adjustment of Triangulation in Space.
- J. KORHONEN: On the Principles of the New Great Adjustment of the Finnish Triangulations. Choice of Adjustment Method and Execution of Numerical Calculations.
- V. R. ÖLANDER: Situation actuelle de la triangulation de la Finlande.
- N. B. PIERRAKEAS: Réseau Primordial Hellénique.
- H. WOLF: Vorschlag zur Durchführung der zweiten Ausgleichung des europäischen Dreiecksnetzes.
Suggestion for a Re-adjustment of the European Triangulation Net.
- D. ZUBAC: Übersicht des Standes der Triangulation I.O. F.N.R. Jugoslawien.
- R. SIGL: Vorschläge zur Neubeobachtung Laplacescher Punkte und zur Beobachtung astronomisch-geodätischer Lotabweichungen für Geoidprofile in der Bundesrepublik.
- K. LEDERSTEGGER: Die Theoretischen Grundlagen der Grossraumtriangulation.
- R. KRAULAND: Untersuchung des Europäischen Dreiecksnetzes im Österreichischen Raum.