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TECHNOLOGY TRANSFER - A GLANCE BACK OVER 39 PHOTOGRAMMETRIC WEEKS

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This year's Photogrammetric Week is the fortieth meeting of a series which began in the year 1909 with Carl Pulfrichs's "Vacation Course in Stereophotogrammetry". Such a series of meetings, which is not supported by a national or international scientific society, is unusual and by no means a matter of course in the field of modern technology. This, therefore, points to the fact that a special need or at least that each time a particular function was evidently fulfilled, if the tradition of this series was able to establish itself and - as we will then see - was able to remain unbroken.

This small anniversary of the 40th Photogrammetric Week gives cause for a glance back and for a brief reflection upon the tradition and today's state of this series of meetings.

1. On the history of the courses

Let us first of all compile the external factors which characterize the series of meetings, the continuation of which can be understood as today's Photogrammetric Weeks.

1.1 In June 1909 Dr. Carl Pulfrich sent out a call in the Zeitschrift für Vermessungswesen for a "Vacation Course in Stereophotogrammetry" which then took place in Jena from 4th - 9th October 1909.

At that time Pulfrich was the head of the Department of Surveying at Carl Zeiss in Jena. He was already known as the inventor of the principle of stereoscopic measurement and as the promotor of its application in the field of photogrammetry. Under his leadership Zeiss was the first company to take up the industrial production of a photogrammetric measuring instrument with Pulfrich's stereocomparator, which was then followed in approximately 1908 by the Stereo-Autograph of von Orel.

46 gentlemen from 6 European countries took part in this first vacation course in 1909. Apart from Germany they came from Austria (4), Yugoslavia (2) and one representative each from Russia, Czechoslovakia and Hungary respectively. The course content consisted of lectures and practical experiments with photogrammetric instruments, which were made available by the Zeiss Company. The aim of the course was to theoretically and practically introduce the then new method of stereophotogrammetry and to make it known. In those days photogrammetry and stereoscopic measurement technology formed in no way a subject of standard teaching at schools of engineering or at colleges.

The participation fee for the 1st vacation course, by the way, was 20 marks. The convenor was Dr. Pulfrich himself. The Zeiss Company only participated in so far as that it made the instruments available and that, as already mentioned, Dr. Pulfrich was the head of the Department there.

This first vacation course, the programme of which has not been handed down in detail, has for a long time been the guiding force as regards the object in view and the content as well as the formal organization. The subsequent courses in Jena have conformed to this pattern practically up to the 2nd World War. The first course in 1909 moreover made history in that during a social gathering of the participants the German Society of Photogrammetry was founded, which accordingly was able last year to celebrate its 75th year of existence.

In quick succession and in the same manner Pulfrich held 5 such vacation courses each of one week's duration from 1909 to 1913, which were visited on an average by over 30 participants. About a third of the participants of these 5 courses came from a total of 15 European foreign countries. The lectures were held in the small hall of the Volkshaus of the Carl Zeiss Foundation in Jena, outside the company buildings. The terrestrial photographs were taken in the near vicinity of Jena. The participants had to take the photographs and carry out the measurements themselves.

Without any reservation it can be stated of Pulfrich's vacation courses in stereophotogrammetry before the 1st World War that they played an important role in the initial circulation of terrestrial photogrammetry and that they together with the Austrian activities established the method and made it known at least in Europe. It has already been mentioned that the Carl Zeiss Company, Jena, was the first large company to undertake the production of photogrammetric instruments and

that thereby an important prerequisite was laid down for the effective development and application of the method.

1.2 The First World War interrupted the series of the vacation courses, which subsequently were not continued for reasons which are not known in detail. The transition to aerial photogrammetry certainly played an important role in this, which then brought thorough discussions with it regarding the conception of the instruments. More direct reasons might, however, well be found in the internal re-organization and the new personnel within the Zeiss Company. Between 1918 - 1920 Pulfrich occupied himself with the design of a universal mechanical stereo-plotter which, however, did not go into production. In place of this the concept of Bauersfeld's Stereoplanigraph, which was based on optical projection, became popular. In the 1920s Pulfrich himself turned towards photometry, while new names such as Sander, Bauersfeld and von Gruber appeared in the field of photogrammetry.

At the time of Pulfrich's death in the year 1927 aerial photogrammetry was already fairly well established. In addition other companies in Germany, France, Italy and Switzerland had also taken up the production of photogrammetric instruments. In the meantime there were also the first college lectures on photogrammetry. The method was, however, not by a long way generally known nor its efficiency recognized. The need to continue making the technology, methodology and application of photogrammtry known remained therefore unchanged.

For this reason, with explicit reference to Pulfrich's vacation courses, the series of courses was taken up again in 1929. Otto von Gruber, at that time still Professor at the Stuttgart University of Technology, before he became Head of Department at Zeiss in 1930, organized the 6th "Vacation Course in Photogrammetry", as it was now called, from 8th - 20th April 1929. This course lasted 2 weeks. It had 41 participants from 14 countries, amongst which there were for the first time two from overseas, namely from Chile and Dutch India. There was little change regarding the setting of the course's aim. The main emphasis, however, was now switching from terrestrial to aerial photogrammetry. In addition to the spreading of the theory of photogrammetry and its practical introduction there now developed a new and explicit emphasis on the exchange of experiences both with and amongst the participants. In the main the mode of the meeting also remained the same. To begin with von Gruber himself was the organiser. The course fee of now 100 marks had to be paid into a personal account. It can be noted of von Gruber that although he most certainly was representing the selfinterest of the company, at the same time, however, it was a real desire of his to propagate and spread photogrammetry as a method. We can readily accept his evident endeavour to remain as objective and as general as possible not only regarding the fundamentals but also with respect to the instruments and the work methods. However, one must not fail to mention that the discussions at that time concerning methods and instruments were conducted very ardently and with great engagement by von Gruber himself, too, and indeed considerably harsher than is customary nowadays.

The lectures of the 1929 vacation course were subsequently written down and published in a book which was translated into many languages and which for a long time fulfilled the function of a standard work. The fundamental chapters are practically still valid today and still of interest.

From 1929 until 1940 a total of 15 meetings were held in Jena in quick succession, which we do not need to describe in detail here, but in the course of which certain changes in the organization came into effect. In 1932 the Zeiss Aerotopograph Company organized the meeting for the first time and was regularly the organiser thereafter. This interesting company set-up, which put an end to the competetive situation in Germany between the two companies Aerotopograph and Carl Zeiss and which played a particular role in the further development of the photogrammetric instrument design right into the sixties, cannot be further illucidated here. However, due to this Professor Hugershoff came to Jena and he subsequently acted as scientific head of the courses together with Otto von Gruber.

The designation of the courses also altered. Until 1932 they were classed as Vacation Courses for Photogrammetry. From 1933 onwards one deviated from the term Vacation Course and they were called Introductory Courses or alternatively Jena Introductory Courses in Photogrammetry. In 1937 the term "Photogrammetric Weeks" appeared for the first time and this was adhered to thereafter During this period, i.e. up until 1940, the courses lasted as a rule for two weeks.

1.3 The 2nd World War and the post-war period not only meant an interruption of the courses, but also a decisive turning point in every aspect.

The Second World War made little contribution to the development of photogrammetry but brought with it a considerable propagation of the aerial photograph. Subsequently the USA, too, made increasing use of this technique, and the worldwide application with the emphasis on carto-

graphy increased rapidly. The German instrument industry, however, was completely ruined and photogrammetry was totally forbidden after the war because of the connection with aviation. It is also known that the American occupying power carried out the precautionary measure of resettling a group of Zeiss colleagues in the West, which lead to separate company developments in Oberkochen and Jena. Hugershoff and von Gruber, the scientific organizers of the Photogrammetric Weeks, had already died in 1941 and 1942, respectively. The successor became Professor Schwidefsky, who on many occasions had taken part in the courses as a lecturer and who was to exert a considerable influence on the further development of the meeting.

The company Zeiss Aerotopograph, organizer of the Photogrammetric Weeks since 1932, had meanwhile under its Director E. O. Messter changed its base from Jena to Munich. It took up the tradition again and already in 1951 sent out an invitation to the "Photogrammetric Week" in Munich, the 21st meeting of this series. On this occasion a new aspect came into play in so far that now a connection with a college was essentially sought after, which had never been the case up till then. In Jena the lectures were indeed held a few times at the University, but it did not really participate in the meetings. The scientific administration of the Photogrammetric Week in Munich was shared between Prof. Schwidefsky of Zeiss Opton, Oberkochen and Prof. Richard Finsterwalder from the Technical Univerity in Munich. The meeting also took place henceforth in the college buildings.

The new beginning was a success despite the still by no means settled situation. In 1951 28 participants were present, from no less than 13 countries, amongst them the USA. Between 1951 and 1963 the Photogrammetric Week was held nine times in Munich with notably increasing participation and were organised principally by the Zeiss Aerotopograph Company in association with the Munich Technical University.

1.4 The sudden death of Prof. Finsterwalder in 1963 brought about another decisive turning point in the history of the Photogrammetric Weeks. In the meantime Prof. Schwidefsky had left the Company and had founded the Institute of Photogrammetry at the Technical College in Karlsruhe. In addition the Zeiss Aerotopograph Company was taken over by Zeiss Oberkochen when Messter left the former company.

Accordingly the Photogrammetric Weeks, for which a regular two year turnus was adhered to from then on, shifted to Karlsruhe and were held there four times from 1965 to 1971. The scientific leadership lay with Prof. Schwidefsky and Dr. Ahrend. The Zeiss Company and the Karlsruhe Technical University were the organizers, with Zeiss being principally responsible for the organization. After the promotion of Dr. Ahrend to a place within the company management, Dr. Meier, Oberkochen and I myself moved up into the scientific leadership of the courses.

After the retirement of Prof. Schwidefsky it was decided to continue the Photogrammetric Weeks in Stuttgart. Meanwhile we are now organizing this course for the seventh time at Stuttgart University. The two year turnus, in coordination with the international congresses, has held good and become established, similarly the reduction to one week's duration since 1971.

1.5 This brief external summary has already shown that the series of meetings actually and consciously represents a continuous tradition. This will also be confirmed when considering the content of the meetings. The event has nevertheless experienced considerable shifts in emphasis which are more or less evident.

The development alone of the participant numbers shows clearly that today it is no longer a question of the same event. During the five periods the number of participants has risen continuously from a mean number of 32 and 36 participants in Jena to an average of 60 participants in Munich, where in 1963 the limit 100 was exceeded for the first time. The Karlsruhe meetings brought a considerable jump with an average of 180 participants. This number increased once again in Stuttgart, where a fairly constant participation of between 230 and 260 participants set in. The number of the participating countries rose in total accordance with this. Since 1965 it is regularly more than 30 countries and in 1981 the highest number to date of 47 countries was reached.

Despite these numbers which point to a certain consistency, considerable fluctuations have occured internally. For example the participation of the USA has recently declined due to their own numerous meetings. The South American countries are similarly rather on the decline. However, a pleasing participation from overseas still exists. Approximately 40 % of the participants today come from Germany, 40 % from European countries and approximately 20 % from overseas. For the first time this year, however, simultaneous translation, which was introduced after the War, is restricted to German/English. Translation into French and Spanish are again omitted. The field of interests of the participants has also gradually shifted. With the more pronounced emphasis on

computer methods and with the corresponding emphasis on methodical problems the participation today of the universities is considerably greater than before.

Considerable shifts of emphasis in respect of the organisation and conception have also taken place silently and without any great notification. Originally the major part of the lecture programme was carried by Pulfrich or alternatively von Gruber and their colleagues. A considerable part of the programme was also borne by the organisers during the Munich and Karlsruhe phase. Their role has recently been considerably reduced in that the lecture section now consistently corresponds to that of a general scientific symposium. Now the organisers give information about their own developments in condensed brief lectures only, unless they can directly contribute to the main scientific themes. This shift of emphasis corresponds generally to the increased significance of methodical problems in photogrammetry, in particular the rapid development of computer methods, which have occured independent of the instrumental progress.

Without having been noticed by the outside world the role of the university as organization partner has also shifted. Whereas the actual organisation of the meeting had always been taken care of by Zeiss, this situation has meanwhile practically reversed. The organisation now practically lies totally with the university, including the winding-up of the finances, which has to take place according to the official fiscal rules.

The various changes correspond to general shifts in conditions and developments. However, they also represent conscious decisions on our part.

2. On the content development

2.1 The fixing of the aim of Pulfrich's vacation courses was quite clearly focussed on giving information about terrestrial photogrammetry as a measurement method and at demonstrating its usefulness for topographical mapping. Theoretical fundamentals, photographic and measurement instruments and practical exercises with the instruments accordingly formed the content of the courses. This concept corresponded to the necessity of just making the method known at all.

The fact that theory and instruments or hardware, as we say today, were intertwined in the closest way possible remained for a long time a determining factor in the methodical development of photogrammetry. This connection was totally a matter of course for Pulfrich, since he not only wanted to provide theoretical information, but primarily wanted to demonstrate the realisation and the application of the method. For this reason practical experiments and demonstrations formed an essential component of the courses right from the very beginning.

In the 2nd phase of the event from 1929 onwards under the leadership of von Gruber and Hugershoff this starting point still essentially existed. Various technical universities had indeed taken up photogrammetry or were on the point of doing so - in particular we can name Stuttgart, Munich, Berlin, but also Vienna, Zürich, Milan - but one could not yet speak of a general propagation. The need for information regarding basics, instruments, methods, applications and results remained unaltered, particularly in respect of aerial photogrammetry. Despite the exchange of experiences with and between the course participants, which was adopted as a new addition to the content, the courses were still primarily information and introductory courses. Nevertheless one can note from the reports of that time that one was conscious of the gradual shift and thought about providing more detailed basic knowledge and specializations in addition to the fundamentals. The courses also had to break free from the international congresses in the meantime established in a four year turnus, which at that time all took place in Europe, and tried to treat themes which were not to be found in the standard textbooks.

2.2 This aspect of continually keeping up-to-date and specialisation became dominant in the post-war development of the Photogrammetric Weeks. Photogrammetry was well enough known in the scientific world (amongst the experts), enjoyed increased regular usage in many countries and was also firmly established as a branch of study at technical colleges. The setting of the aim regarding the content of the Photogrammetric Weeks, therefore, shifted increasingly to basic theory, technical and methodical innovations, as well as to special applications and interesting special developments. Focal points such as aerial triangulation, photomaps, automation, computer methods and analytical plotters, digital mapping, remote sensing and image processing pay tribute to the variety and actuality of the contents.

With the general acceleration of technological developments in the last 10 - 15 years the problem of actualization poses itself more acutely, above all also in connection with the changing fields of work and new specialist groups, which come into contact with photogrammetry. In addition the number of publications has vastly increased during this time. And the organisers are confronted

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with the fact that today both internationally and regionally a flood of symposia, seminars and workshops are offered to the specialist world. Nowadays one takes that for granted and is generally not conscious of the fact that this explosionlike development of scientific meetings does not date back very far.

During the same time the emphases regarding content matter of photogrammetry have also clearly shifted. With the development of data processing and digital technology methodical developments gained a new independence. Software is today on the same level as hardware. Connected with this there is a strong impact of science based methods, especially in the field of data processing. And at the same time photogrammetry has become vastly dependent on developments in electronics and data processing including interactive and graphic data processing.

2.3 Against the tense background of contradictory demands and fundamental problems the Photogrammetric Weeks have been considerably remodelled during the last two decades in order to remain efficient, topical and interesting and in order to maintain a general continuity in respect of the target groups, the areas of application, the contents and the scientific niveau.

The following measures can be named: fundamental restrictions to one week's duration (since 1971), distribution of the lectures to the participants and complete publication of the proceedings (since 1975), consistent orientation of the lecture section as a scientific symposium, treatment each time of selected focal themes, inclusion of the university in independent demonstrations, shifting of demonstrations towards technical-methodical and software developments.

The endeavour to report on new developments or to prepare for new development can be clearly seen from the focal themes. The fact that always very central and also in retrospect important developments were selected may be verified by the following key-words, which indeed embody the development of modern photogrammetry: analytical photogrammetry (repeatedly since 1955), optics, photographic quality, contrast transfer functions (1956), analytical aerial triangulation and block adjustment (repeatedly since 1958), automation (1962, 1969), photogrammetry for third world countries (1962), information theory and pattern recognition (1963), satellite photogrammetry (1963), ortho-photography (since 1965), photo-interpretation (1969), digital terrain models (since 1971), remote sensing (1973, 1977), close range photogrammetry (1971), computer aided and digital mapping (since 1975), analytical plotters (since 1977), land information systems (1979), metric camera, Spacelab experiment (1979), digital image processing (1983, 1985), topographical data banks (1985); in addition repeatedly topics regarding cameras and photographic techniques, instruments, data processing, applications and precision.

3. Today's position

The establishment of the Photogrammetric Weeks, whilst maintaining the tradition and the continuity of the series as a meeting, has been an obvious success. The same as ever before it met with great interest. First and foremost we must thank our participants for this, and in particular those participants, who repeatedly took part.

Without doubt several overall aspects have contributed towards the hitherto permanent success of the meeting, which despite the various other developments still hold valid today. The Photogrammetric Weeks always intended to fulfill the function of an information and discussion forum. They have continually attempted to establish a connection on the one hand between scientific knowledge and technical realisation and on the other hand between technical developments and practical application. In this function they represent a further education course which facilitates the access to scientific developments for the practitioners and in turn makes the exchange of experiences with the practice possible for the scientists.

With this aim in view we fulfill the permanent task of establishing within the technical field the feed-back between development and practice. At the same time we are hereby integrated into the general task, which faces science and technology and thereby also universities and scientifically oriented industry, namely that of bridging the gap to society to the advantage of human beings on this earth.

This task is recognized today both politically and scientifically and is for example characterized by the catchword technology transfer. The Photogrammetric Week has always felt itself committed to this task. In the future this task will also objectively exist.

Various forms are certainly conceivable for the continuation and the future development of the Photogrammetric Week. The organizers will have to conscientiously consider the respective decisions and adaptations.

As far as the present is concerned it can be stated on the occasion of the fortieth Photogrammetric Week that the primary concern of mediating between science and practice embodies the general aim the same as ever or even more so than ever before. One can only wish and hope that future meetings in the field of photogrammetry and its related disciplines continue to devote themselves to this task with engagement and success.

Abstract

The Photogrammetric Weeks are traced back to the "Vacation Courses in Stereophotogrammetry" which Prof. Pulfrich started in Jena in 1909. The further development is reviewed which led to the present form as scientific meeting, jointly organized by university and industry and held in a regular 2-years turnus.
The originial motivation of presenting to and discussing with scientists and practitioners theory, instrumentation and application of photogrammetry has remained valid, gradually modified by emphasizing new scientific and technological developments and their impact on working methods and application.

TECHNOLOGIETRANSFER - EIN RÜCKBLICK AUF 39 PHOTOGRAMMETRISCHE WOCHEN

Zusammenfassung

Die Photogrammetrischen Wochen lassen sich auf die "Ferienkurse in Stereophotogrammetry" zurückverfolgen, die Prof. Pulfrich 1909 in Jena begann. Ein Überblick auf die Weiterentwicklung wird gegeben, die zu der heutigen Form als wissenschaftliches Forum führte, das gemeinsam von Universität und Industrie organisiert und in einem regelmäßigen 2-jährigen Turnus abegehalten wird.
Die ursprüngliche Motivierung, mit Wissenschaftlern und Praktikern zu diskutieren und ihnen Theorie, Benutzung von Instrumenten und Anwendung der Photogrammetrie vorzustellen, bleibt auch nach allmählicher Veränderung durch Hervorhebung neuer wissenschaftlicher und technologischer Entwicklungen und deren Einfluß auf Arbeitsmethoden und Anwendungen bestehen.

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Summary of the Photogrammetric Weeks

Serial No.	Course	Location	Organization/ Direction	Description	Participants (on average)
1	04.10.- 09.10.1909	Jena	Pulfrich	Vacation course in stereophotogrammetry	
2	03.10.- 08.10.1910	Jena	"	"	
3	24.04.- 29.04.1911	Jena	"	"	
4	05.08.- 10.08.1912	Jena	"	"	(32)
5	01.09.- 06.09.1913	Jena	"	"	
6	08.04.- 20.04.1929	Jena	von Gruber	Vacation course in Photogrammetry	
7	16.03.- 28.03.1931	Jena	"	"	
8	26.09.- 08.10.1932	Jena	Hugershoff	Jena vacation course for aerial photogrammetry	
9	10.10.- 27.10.1932	Jena	"	"	
10	18.09.- 24.09.1933	Jena	von Gruber/ Hugershoff	Introductory course in photogrammetry	
11	19.03.- 25.03.1934	Jena	"	"	(36)
12	24.09.- 30.09.1934	Jena	"	"	
13	04.04.- 14.04.1935	Jena	"	"	
14	09.09.- 12.09.1935	Jena	"	"	
15	30.03.- 04.04.1936	Jena	"	"	
16	15.10.- 24.10.1936	Jena	"	"	
17	11.03.- 20.03.1937	Jena	"	Photogrammetric Week(s)	
18	28.03.- 09.04.1938	Jena	"	"	
19	20.03.- 01.04.1939	Jena	"	"	
20	? 1940	Jena	"	"	

Serial No.	Course	Location	Organization/ Direction	Description	Participants (on average)
21	24.09.- 06.10.1951	Munich	Finsterwalder/ Schwidefsky	Munich Photogrammetric Weeks	
22	15.03.- 27.03.1954	Munich	"	"	
23	12.09.- 24.09.1955	Munich	"	"	
24	06.08.- 18.08.1956	Munich	"	"	
25	01.09.- 13.09.1958	Munich	"	"	
26	07.09.- 19.09.1959	Munich	"	"	
27	26.09.- 08.10.1960	Munich	"	"	(60)
28	02.04.- 14.04.1962	Munich	"	"	
29	02.09.- 14.09.1963	Munich	"	"	
30	27.09.- 09.10.1965	Karlsruhe	Ahrend/Schwidefsky	Photogrammetric Weeks	
31	25.09.- 06.10.1967	Karlsruhe	"	"	
32	29.09.- 10.10.1969	Karlsruhe	Meier/Schwidefksy/ Ackermann	"	
33	20.09.- 25.09.1971	Karlsruhe	"	"	(180)
34	10.09.- 15.09.1973	Stuttgart	Meier/Schwidefsky/ Ackermann	Photogrammetric Week	
35	08.09.- 13.09.1975	Stuttgart	Meier/Ackermann	"	
36	05.09.- 10.09.1977	Stuttgart	"	"	
37	24.09.- 28.09.1979	Stuttgart	"	"	
38	05.10.- 10.10.1981	Stuttgart	"	"	(240)
39	19.09.- 24.09.1983	Stuttgart	"	"	
40	30.09.- 05.10.1985	Stuttgart	"	"	

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