# Spending a life for photogrammetry - on the occasion of the 70th birthday of Prof. Dr. mult. Fritz Ackermann

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## 1. Introduction

It is my great pleasure to review the scientific work of the ISPRS Honorary Member, my honoured predecessor and colleague, Prof. i. R. Dr.-Ing. Dr. techn. h.c. Dr. techn. E. h. Dr.-Ing. E.h. Friedrich Ackermann, on the occasion of his 70th birthday. Fritz Ackermann is well known all over the world as pioneer of analytical and digital photogrammetry. The Institute for Photogrammetry (IfP) of Stuttgart University held a Birthday Colloquium on December 2nd, 1999 in Stuttgart, to honour Fritz Ackermann and above all to express him the gratitude of a whole professional society for his contributions in photogrammetry for more than 40 years. He founded IfP already in 1966, just after accepting the position as *Professor of Photogrammetry and Surveying* at Stuttgart University (1966). Thus, his successor and IfP members also wanted to thank him again for his support during the 26 years he spent as Director of this University institute. He not only founded IfP, but also developed it to a world-wide renowned institution, known for excellent photogrammetric research, development and education. Furthermore, some of his research work is still up-to-date and lively discussed at IfP, and new projects have been carried out using the profound know-how of the IfP staff members in digital photogrammetric data collection and image data processing. Since some years, IfP has been also researching the area of *Geographic Information Systems (GIS*), with aim to integrate the other two major research groups at IfP, namely *Photogrammetry and Remote Sensing* and *Sensor Integration*, and find synergisms between photogrammetric data collection and GIS data storage and analysis.

Prof. Fritz Ackermann has been often honoured, awarded prizes and acknowledged, so that it is no easy task to recapitulate all this for his 70th birthday. He is seen as one of the outstanding lecturers in our field of photogrammetry, and is a word-wide recognised researcher personality. A retrospective view of his educational and professional career shows a smooth and brilliant scientific career, which, from the point of view of Prof. Ackermann, very likely also contained many difficult situations that had to be tackled.

## 2. Laudatio

F. Ackermann was born in Moosbeuren, district of Ehingen, Donau on November 1, 1929. His early education was made difficult, due to the Second World War. After attending the primary schools at Moosbeuren and Ehingen (1936 - 1940), he at-

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tended the secondary school (today grammar school) Ehingen, which he was able to complete in 1949 successfully with his Abitur. Surely, only few people know that he studied for one semester physics at the University of Tübingen, before he studied surveying at the Technische Hochschule Stuttgart (1950 - 1954*). There is no need to prove what damage and loss in photogrammetry we would have, if at that time he had decided not to change from physics to surveying*. Immediately after finishing his studies, he was employed as a diploma engineer at Zeiss Aero-Topograph, based in Munich and Oberkochen, in order to gain first experiences in the construction of photogrammetric film-based data collection and evaluation instruments.

From 1958 until taking up his appointment as professor at Stuttgart University in 1966, F. Ackermann was member of the International Training Centre (ITC) for Earth Sciences, then in Delft, today in Enschede, The Netherlands, working as a scientific employee and lecturer in the field of photogrammetry. There, he completed in 1961 the Master of Science in Photogrammetry. Together with his colleagues H. G. Jerie and C. M. A. van den Hout he was able to discuss and realise basic ideas for the photogrammetric block adjustment. This research was to determine his life's work for at least two decades, which at this time could very likely not be foreseen. In 1964, he gained his doctorate as Dr.-Ing. with a thesis "Fehlertheoretische Untersuchungen über die Genauigkeit photogrammetrischer Streifentriangulationen“ (Error theoretic investigations on the accuracy of photogrammetric strip triangulations, German Geodetic Commission (DGK) at the Bavarian Academy of Sciences, Munich, Reihe C, No. 87), and was the first recipient of the Otto von Gruber Award at the ISP Congress in Lisbon for his highly standing scientific work.

With the appointment of Prof. E. Gotthardt from Stuttgart University to the Technical University of Munich, the Professorship in Photogrammetry and Surveying had become vacant and F. Ackermann was appointed to this position on April 1, 1966. He then soon founded the Institute for Photogrammetry and became its Director.

Based on his work on block adjustment at ITC, the newly founded institute had a framework, within which the scientific work could be integrated. Model approaches for analytic aerotriangulation in form of strips and blocks, independent models as well as the bundle block solution were to be developed methodologically and implemented in software. Extensive precision examinations as well as various applications introduced the analytic aerotriangulation into practice. With this work, world-wide known and used for nearly 30 years in software package form under the abbreviations PAT-M and PAT-B (Photogrammetric Aero-Triangulation with independent Models or Bundle blocks respectively), F. Ackermann was able to make great contributions on a world-wide scale. For these efforts and brilliant scientific contributions, he was awarded 1976 the highest honour by the *International Society for Photogrammetry (today ISPRS),* namely the Brock Gold Medal Award, during the Congress in Helsinki.

With the beginning of the seventies, a further development of the analytic photogrammetry began to emerge, for which algorithms and methods as well as software had to be developed - the Digital Terrain Model (DTM). Although DTM generation software was already available and offered by various software companies, their introduction into practice failed to materialise. With the work of the IfP, new model approaches could be tested and integrated into the DTM programme system SCOP (Stuttgart Contour Programme) which is still being offered today and used world-wide. The commitment of Prof. F. Ackermann to co-operation with his then assistant and later colleague Prof. K. Kraus (Technical University Vienna) could bring about a successful synthesis of theory and practice in that area.

His work on aerotriangulation and Digital Terrain Models in the then existing form and methodology would have been already sufficient until the end of his professional career. However, people who know F. Ackermann realise that he does not want to rest on his achievements and that even today he tries out new avenues. Thus, his statement from that time: *„If I retire now, it would not matter much, but for my employees it would be a disaster“*. This meant that the way was paved for new developments, which were to be initiated by him.

Automating the DTM data collection was to determine the next decade of his professional career. At the end of the seventies, F. Ackermann started to think about the implementation of digital image matching. With a project supported by the German Research Foundation (Deutsche Forschungsgemeinschaft, (DFG)) for digital point transfer, IfP was able to familiarise itself with the field of digital image correlation. Already in 1983, he presented the basic idea of *least squares area-based matching* with the contribution "*High Precision Digital Image Correlation"* at the 39th Photogrammetric Week – and IfP started, in co-operation with the firm Carl Zeiss, Oberkochen, with the development of the programme system TopoSURF (developed later to the package Match-T). At that time, image scanning was carried out in connection with an analytical plotter Zeiss Planicomp C 100, whereby the digital image was collected in parts by CCD-cameras. Later developments, using similar hardware and software and an additional texture projector, led to the programme system InduSURF (developed later to the package Match-I), which was to be used in car manufacturing for the 3-D reconstruction of vehicle components. Due to the extensive research on point matching, IfP became the world-wide "re-

search centre of reference" in this field. Suggestions and work for the efficient determination of approximate values for matching followed. Further developments were then concentrated on a new programme system for the automatic generation of Digital Terrain Models, since years known as MATCH-T (matching topography), which is also used in INTERGRAPH's ImageStations and, under the name TOPOSURF (topographic surface generation), in ZEISS Phodis ST (both companies started a joint venture in 1999, called Z/I Imaging).

Besides the work on digital image matching, aerotriangulation was still a main concern for F. Ackermann. Thus, he pursued with great interest the pilot applications of the spaceborne positioning system NAVSTAR-GPS, which were being carried out in the 80s for purposes of land surveying. At that time, the preparations for setting up a special research field (Sonderforschungsbereich, SFB) in the Faculty of Civil Engineering and Surveying of Stuttgart University began. Finally, the *SFB 228 High Precision Navigation* could be supported from 1984 onwards by DFG. Within this SFB, one research project encouraged by F. Ackermann dealt with the online determination of the external orientation parameters of a film-based photogrammetric camera by using GPS, in order to reduce the number of control points to a minimum. In this field, too, the extensive research work of IfP proved that the position parameters of the camera projection centres could be determined precisely by GPS. In doing so, only few control points located in the corners of a photogrammetric block are needed. Later, other newer navigation methods, like INS, were integrated in the aerial triangulation, while digital image matching was used for digital aerial triangulation and automatic point transfer in the programme package Match-AT.

From 1988 to 1993, research was performed at IfP on the direct DTM generation with laser profiling, in order to overcome the deficiencies of the photogrammetric DTM generation, especially in wooded and urban areas. It could be proven that pulsed laser profilers could collect the topographic surface in the dm-range, even in forest regions, and therefore were very suitable as complementary sensors for photogrammetric data collection. Based on this research, IfP worked and is still working on a new generation of laser scanners, not only to efficiently collect DTM data but also to deliver virtual landscapes and 3D city models.

Prof. Ackermann had always directed his research activities towards satisfying professional requirements and pushed scientific developments to the point that they were mature for practical implementation. This characteristic led him also to the foundation of his own photogrammetric firm (now INPHO) in 1980, which in close co-operation with IfP and other partners developed some of the most successful and widely used software packages.

The suggestions initiated by Prof. Ackermann in the scientific field were gladly adopted by other scientists involved in his projects; they were also able to evolve to excellent scientists, due to his very tolerant management style, which granted a lot of scope for development to his co-workers. Thus, it does not come as a surprise that the colleagues Prof. Heinrich Ebner, Munich, Prof. Karl Kraus, Vienna, and Prof. Wolfgang Förstner, Bonn were able to doctorate and habilitate under his supervision. Altogether, he was responsible for more than 30 Ph.D. candidates.

Apart from his scientific interests and aims, Prof. F. Ackermann has also held many honorary positions: at Stuttgart University he was repeatedly active as Dean of the Surveying Department, Deputy Dean of the Faculty of Civil Engineering and Surveying, was member and chairman of the studies commission (curriculum Surveying) and belonged to the board of examiners in the Surveying Department. Moreover, he was active in many appointment committees. In spite of these additional commitments which, however, are inevitable for a university professor, he still managed to find time to contribute to the work of several more panels.

Until 1998, Prof. Fritz Ackermann was a member of the scientific council of the ITC, Enschede, The Netherlands and up to 1994 he regularly organised lectures there in the Master Course "Photogrammetry". He was a member of the German Geodetic Commission at the Bavarian Academy of Sciences in Munich, where he worked in many of its working groups. Many times, DFG relied on him as an expert and ultimate authority in the field of geodesy and geophysics. For decades, he was involved in the European Organisation for Experimental Photogrammetric Research (OEEPE) as a national member and even as its president from 1992 - 1994. He also was a member of the executive committee of the German School for Photogrammetry Operators (IPO), Stuttgart and of their board of sponsors respectively. Within ISPRS, Prof. Fritz Ackermann was President of Commission III "Mathematical methods" (1972-76), contributing substantially to many ISPRS working groups with his research. From 1976 - 1980, he was president of the German Society for Photogrammetry and Remote Sensing (DGPF) and from this position also contributed to the successful 1980 ISP Congress in Hamburg. In the late 1980s, Fritz Ackermann was selected as consultant for the construction of a three-line sensor for stereo and multispectral imagery (MOMS-O2). Since 1990, he has been the chairman of the MOMS Science Team as Principal Investigator "Photogrammetry". During the second German Spacelab mission (26 April - 6 May 1993), the camera succeeded in recording about 7 million square km of the earth surface, while it was also successful on-board of the Russian Space Station Mir. There were further memberships in various national and international committees, which, how-

ever, will not be listed here. Ackermann also played a substantial role in the initiation of a large, important SFB project "Semantic Modelling and Extraction of Spatial Objects from Images and Maps" involving more than 10 research groups from 1993 to 1999, and trying to bundle and co-ordinate research activities in Germany on this important field.

Finally, it should be mentioned that Prof. Fritz Ackermann was entrusted with the responsibility for the Photogrammetric Weeks (PhoWo), and had been organising this event from 1973 to 1991 in Stuttgart. The PhoWo take place every two years and are co-organised together with Carl Zeiss, Oberkochen (now Z/I Imaging, Oberkochen). Under his chairmanship, PhoWo developed into an educational and technology transfer event of high scientific level, which is renowned world-wide and very well attended (the 47th Photogrammetric Week in September 1999 was visited by 570 participants from 55 countries all over the world).

The short description above provides an overview of the scientific work of Prof. Fritz Ackermann, which, looking back, is fascinating and makes us feel grateful to him. Apart from the scientist Fritz Ackermann, there is also the human being Fritz Ackermann, who in his humorous way understates many of his achievements and makes many things appear as simple matters. In spite of his understatements, he was awarded many distinguished honours, some of which shall be mentioned here.

The Technical University Helsinki, Finland, honoured Prof. Fritz Ackermann in 1988 with the academic degree of Dr. techn. h. c. for his scientific merit in the field of photogrammetry, and the same acknowledgement in form of a Dr. techn. E. h. was awarded to him by the Technical University, Vienna, Austria in 1992. This series was continued in 1995, when he received by the University of Hannover the Dr.-Ing. E.h. degree. In 1989, the Wuhan University of Surveying and Mapping, China awarded him the status of a honorary professor. In 1990 Prof. F. Ackermann became honorary member of the British Society for Photogrammetry. The American Society for Photogrammetry and Remote Sensing (ASPRS) honoured Prof. Ackermann with the Honorary Membership (1995), while the great distinction of ISPRS Honorary Membership was offered him during the opening ceremony of the 1996 Vienna Congress. The German Society for Photogrammetry and Remote Sensing also elected Prof. Ackermann and Prof. Konecny as Honorary Members (1999). His awards and honours may even continue, as his scientific work and personality have had an enormous impact in our field.

## 3. The Birthday Colloquium

The 70th Birthday Colloquium, held in Stuttgart on December 2nd, 1999 was a great success. More than 300 colleagues, friends, students and people from all over the world participated. Well-known speakers contributed to this colloquium, opened by the author with the Laudatio, first of all to thank Prof. Ackermann. Welcome addresses were given by Prof. Jörg Albertz, President of the German Society for Photogrammetry and Remote Sensing (DGPF), Prof. Otto Kölbl, President of OEEPE, and finally by Dr. Larry Fritz, President of ISPRS. Dr. Fritz started the scientific papers with a stimulating keynote on *"New era for Photogrammetry, Remote Sensing and Spatial Information Sciences"*. After his speech he handed to Prof. Ackermann a present on behalf of ISPRS (see Fig. 1) and thanked him for his scientific impact on the society.

After Dr. Fritz, Alfred Hils, a former team-mate and life-long friend of Prof. Ackermann, remembered the time when both were students at Stuttgart University. The official programme was enriched by two further remarkable talks by Prof. Wolfgang Förstner, Bonn University, and Prof. Heinrich Ebner, Technical University of Munich, both ex-members of the scientific staff of Prof. Ackermann. Prof. Förstner remembered the period when the first ideas on digital image matching were born and investigated (during the 80s). He was able to present all the pros and cons of different methods very lively, giving the participants a feeling of the institute's atmosphere during those days. Prof. Ebner's talk *"Street Extraction and Image Scale – a Topic of the 90s"* demonstrated with many examples that linear feature extraction has reached a high level, that image interpretation based on semantic context is complex and should be a focus of photogrammetric research for the next years.

After the invited speeches, a birthday party served as a relaxed setting to congratulate Prof. Fritz Ackermann, to meet old friends and make new ones, and last but not least to have a pleasant get-together (see Fig. 2).

## 4. Conclusion

From my personal point of view, I would like to emphasise Prof. Ackermann's helpful and considerate way of treating people. I like to remember the pleasant way in which he handed over the Institute for Photogrammetry in 1992. Since then, we were able to have many conversations, not only of scientific, but also of general content, which showed the human side of Fritz Ackermann and started a lasting friendship. We, all his co-workers of the Institute of Photogrammetry, Stuttgart University and myself as his successor, would like to thank him for his commitment, and we wish him many happy and successful years at home, INPHO and IfP. Officially, Prof. Fritz Ackermann retired in 1992, yet we all can not imagine that he will not continue pursuing his scientific interests until the end of his life. Therefore, we wish him all the very best for his 70th birthday under the motto: *"All the best and keep it up, Fritz Ackermann!"*

Fig. 1. Larry Fritz, President of ISPRS, presents a gift of appreciation on behalf of the ISPRS to Prof. F. Ackermann.

Fig. 2. A snapshot from the birthday party of Prof. F. Ackermann (here in the middle, discussing with the President of the German Society for Photogrammetry and Remote Sensing, Prof. J. Albertz).