



Manfred Heckl - a pioneer in engineering acoustics

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ABSTRACT

Recognition, reminiscence and missing are not tied to particular days of remembrance but such days may bundle our respective memories and thus make us painfully aware of the extent of what we are missing as well as of what we owe to what we lost. 20 years after his untimely death Manfred Heckl continues to be influential by both, by his pioneering contributions to engineering acoustics as well as by showing the way forward to a pragmatic, solution oriented approach based on optimally compromising between physical modelling and practicable handling. As both these merits, extending our scientific insight and further developing and adapting the most promising conceptual approach to relevant problems of today are of persistent relevance, it is worth of looking back to their important and exemplary roots as substantiated in the work of Manfred Heckl.

This paper introduces and summarizes the work and the personality of Manfred Heckl which will be further explored and assessed in a particular memorial session being held at Inter-Noise 2016. This session will give an overview of his work and his achievements as well as of their relevance to noise control engineering from then to the present day ([1]).

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Manfred Heckl (1990)

1. INTRODUCTION

It is exactly 20 years ago that our international community of acoustic engineers was shocked by the untimely and unexpected death of Manfred Heckl. After short but serious suffering he passed away from the complications of a brain surgery on August 16, 1996. This sudden death was a shaking, deeply moving experience for many because neither his age of 66 nor his most recent condition had indicated any serious health problem. On the contrary, hundreds of guests, many of them having travelled from far, had verified him being in good shape and spirit at his birthday and farewell party in summer 1995 when he became 65 and was given emeritus status at his Institute of Technical Acoustics at the Berlin Technical University.

He was full of energy then and made plans for coming back to Munich, to his beloved Bavaria and to Müller-BBM, the acoustical engineering company he had founded together with his school friend Helmut Müller and some other excellent and farsighted colleagues 33 years before, in 1962. But all best wishes were in vain and soon turned to be unfulfillable because a malicious brain tumor had begun to accomplish its hidden but deadly work. Hardly more than one year later, Manfred Heckl died after the unsuccessful attempt to remove this dreadful risk by surgery.

He died much too early, thus being deprived himself of seeing the fruits of his work and depriving us, the bereaved, of the great chance to better exploit his heritage. He would have enjoyed to see his seeds blossom and his influence grow, the influence of a shining example in both, physical and technical skills and methodological approaches. Although he always seemed to be uncomfortable with praise and recognition, this fame would just have pleased him, would, as he liked to say, have done good to him.

2. BRIEF LIFE STORY

Manfred Heckl was born on July 15, 1930, in Rennertshofen near Neuburg on the Danube. His exceptional talents proved to be obvious when he was a schoolboy yet and student later. He amazes by excellent work and his phenomenal memory which will surprise others at times again till the very end. During his studies of physics he comes – together with Helmut Müller – across the very right teacher, the lecturer Lothar Cremer whose lecture on acoustics is able to fascinate and permanently bind the two friends to this discipline.

In 1954 Manfred Heckl completes his studies of physics with an experimental diploma thesis on sound bridges at floating floors. He then follows his teacher Lothar Cremer as scientific assistant to the Institute of Technical Acoustics at the Technical University (TU) of Berlin, which had been founded by Lothar Cremer just before. He then graduates in 1957 with a PhD thesis on sound radiation and attenuation of cylindrical shells. During his time in Berlin he also starts his family. He marries his wife Anna in 1956 and becomes a father of five children until 1964. His eldest daughter Maria follows his professional example and does scientific research at the university in Keele, GB.

After three years in the US, where he was with the reputable acoustic consultancy Bolt, Beranek and Newman, BBN, he returned to Germany in 1962 to start the German consultancy “Schalltechnisches Beratungsbüro Müller-BBN” in Munich together with his friend Helmut Müller, his teacher Lothar Cremer, Ludwig Schreiber and BBN, represented by Leo Beranek.

Manfred Heckl has essentially contributed to shape this acoustical consultancy which later developed to be the largest one in the world. His influence was formative in both, technical and economic matters. His profound understanding of physical and mathematical issues was the ideal basis of many novel approaches to solve the variety of new problems in practical engineering acoustics. But also as chief financial officer and as authorized signatory he gave decisive impetus by applying his targeted economic thinking. Important models like the unique share-based employee participation system have proven their value until today.

After his post doctoral lecturer qualification which he received for a comprehensive survey on generation and control of flow-induced noise he follows, in 1973, a call to the chair of Technical Acoustics at TU Berlin to succeed Lothar Cremer. Manfred Heckl stays there for 22 years. Guest professorships bring him to India in 1978 and 1990, shorter teaching stays to England, Russia and Argentina. His outstanding skills and his strong international reputation have brought him many awards, among them the Rayleigh Medal of the British Institute of Acoustics (IOA) in 1992 and the Helmholtz Medal of the German Acoustical Society, DEGA, posthumously in 1996.

On October 1, 1995, Manfred Heckl retires to become an active professor emeritus. This step culminates in an impressive scientific colloquium followed by a unique, unforgettable party. His retirement was thought to be an active one because Manfred Heckl still had many plans: Active support of the German Acoustical Society, DEGA, Organization of scientific meetings like Euro-Noise 1998 in Munich and Forum Acusticum 1999 in Berlin and, above all - and this still saddens me until the present day – active collaboration with me, with us in our company Müller-BBM.

But all this was not to happen. Manfred Heckl died on August 16, 1996, from the complications of a brain surgery. Apart from being concerned about the risks of his illness, our last conversation, a few days before his death only, was dominated by confidence and optimism together with great anticipation for further cooperation. That's exactly how we kept and go on keeping him in our memories: as an energetic, cooperative colleague who was eager for insight and used to take answers as a starting point for new questions mainly.

3. CONTRIBUTIONS TO ENGINEERING ACOUSTICS

It is obvious that such a vita, such a variety of professional activities leave their traces. So let us search for these traces, let us address the question what was and what is the original contribution of Manfred Heckl to the acoustic knowledge and tools today. In the mid-fifties of the last century when he decided for his branches of acoustics, these acoustics were at the beginning of a period which more and more was to be characterized by problems of avoiding or reducing sound.

Avoiding, controlling sound, however, can be done the better, the more its generation is understood. Consequently, all interest was directed to those phenomena which preceded the propagation of existing air-borne sounds: the generation of sound in gaseous and liquid media with and without flow and the excitation, propagation and radiation of structure-borne sound.

Manfred Heckl's profound knowledge of fluid and structural dynamics was the starting point for pioneering works. This works first investigated the relation between the excitation of flat structures and the corresponding sound radiation and later then dealt with establishing and introducing statistical energy analysis, SEA. Other focusses of later research work were:

- description and numerical treatment of wave fields in coupled structures, inhomogenous and layered media,
- generalization and application of the reciprocity principle,
- successful treatment of many theoretical and practical problems in building-, hydro- and machine acoustics,
- investigation of complicated sound generating mechanisms, e.g. for rolling noise on roads and rails or for nonlinear mechanisms,
- alternative approaches like mechanics of principles or the synthesis of equivalent sources.
- illustrative visualization of complex acoustical fields even in many, partly brilliant films.

Apart from the development of important new methods the greatest merit of Manfred Heckl may be seen in his exemplary application of theoretical insight to the numerous problems of acoustics in practice. To get there, numerical procedures always have been an aid, a tool to him but never a method. As aiding tool, however, he used numerics intensively. To enable him to do this, his office was equipped in the 60s already with the first private terminal installed in Germany giving time-sharing on-line access via modem to a mainframe computer in the US.

The Heckl-specific mixture of phenomenal physical intuition, application-oriented ability to think in abstract terms and perfect mastery of mathematical methods for computation and approximation allowed him – apart from exact solutions - to find many useful and practicable formulas for estimation and prediction of acoustical parameters and field quantities. He thus really had an absolute vocation not only for further developing the current state of knowledge but also to apply it to practical problems, to make it available to the daily work of acoustic engineers.

Both, his preference for formulating, evaluating and approximating theoretical approaches as well as his continuous reference to practical problems are ideally summarized in an aphorism which he often liked to quote:

There is nothing as practical as a correct theory.

This typical motto best characterizes his approach and technical preferences and is exemplarily implemented in his most famous book “Körperschall” (1967, [2]) which he wrote together with Lothar Cremer and which had been translated soon for an English edition (1973, [3]). Following their subtitles “physical basics and technical applications” in [2] and “structural vibrations and sound radiation at audio frequencies” in [3], these books form a perfect and exemplary symbiotic relationship between these physical basics and their technical applications. This was of particular importance if we realize that the physical basics introduced in these books were not common knowledge of acousticians at that time. Structural dynamics was seen to be a complicated matter requiring very specific previous knowledge and the great achievement of the book was to overcome engineer's inhibitions by introducing the complex physical and mathematical context in an illustrative, easy to follow way.

The popularity of this book and of the many films produced by him to illustrate particular effects in structures, fluids and at their couplings by moving particles can not better be characterized than by the following episode: In reply to the question whether he had read the structure-borne sound book of Heckl already, an acoustic colleague from Northern Europe promptly gave a good retort: No, but he had seen the film already.

Other important and recognized books were and are the “Taschenbuch der Technischen Akustik” ([1975],[4]), edited together with Helmut Müller and written together with many German colleagues to

compile all relevant information, knowledge and tools of the time and thus to successfully apply engineering acoustics to the many practical problems. Again, a later, updated version has been edited in English as “Handbook of Engineering Acoustics” (2013,[5]). Finally, the lecture notes on “Modern methods in Analytical Acoustics”, written in cooperation with other British authors should be mentioned here ([6]).

Apart from his books Manfred Heckl’s scientific work is documented in far more than hundred scientific publications. This number would be essentially larger if he had followed the widespread practice to consider himself as co-author in cases where he only had stimulated or supervised the respective work.

4. TEACHING ACTIVITIES AND IMPACT

The influence and impact of the university professor and lecturer Manfred Heckl by far exceeded his purely academic teaching successes. When he took over the chair of Lothar Cremer in 1973 he established a new style in the Institute, replacing professorial authority by liberal, transparent and largely equitable collegiality. Manfred Heckl liked to say that his predecessor, other than he himself, still had been a real professor. However, his colleagues, research assistants, staff members and students were sure that he, at his time, was the right professor.

Apart from his research activities, Manfred Heckl’s teaching activities have also left clear traces. He has passed his knowledge not only in more than hundred lecture courses and seminars, but, furthermore, personal conversations and numerous discussions have helped to disseminate his skills, his experiences and – maybe this was most important – his way of thinking and analyzing.

His main lectures dealt with

- Theoretical Acoustics
- Structure-Borne Sound
- Flow Acoustics
- Noise Abatement and
- Traffic Noise

With these lectures Manfred Heckl introduced a new formal tradition which was characterized by a clear and systematic theoretical basis. This included the concept of general mechanics as well as the consequent treatment of advanced mathematical tools. The lectures also were characterized by high clarity and by many instructive experiments to illustrate the basics of acoustics. Like few others only, Manfred Heckl had the virtuosic ease of the real initiate and he made good use of it. He made me realize that one has understood only what one can explain in a simple way.

His lectures were rounded off by many caring attentions like offering a glass of Champaign after having demonstrated the effect of various temporal changes of the volume velocity while opening the bottles or with Christmas cookies which he, being a baker’s son, had baked himself and decorated then with an acoustic formula: Following a wordplay in German, he said it were very important to him that his students would have stowed away (grasped) one formula at least.

When initiating works and working topics he did not follow his personal interests only. Instead he always endeavored to extend the working spectrum of his institute. Without his desire to establish active noise and vibration control at the Institute in Berlin in the seventies already, I would not be an acoustician today. I am deeply grateful for this guidance in my personal professional life.

I know that many others feel the same. Manfred Heckl didn’t need simplistic familiarity to sustainably shape his many disciples: technically, methodologically, by his way of thinking and working, by his shining example. In this sense, in the extensive shape he gave to his disciples, Manfred Heckl lives on.

Much still is left to be mentioned in this reminiscence, e.g.

- the supervision and examination of more than 90 PhD dissertations,
- the promotion of many international guest scientists,
- his service as dean and vice-dean with real feats of mediation for 12 years,
- the editing of leading technical journals or
- his dedicated support of countries with difficult working conditions.

But such listings are dammed to incompleteness not only for reasons of limitation. Even if complete they were patchwork only if compared to the merits he really had acquired.

5. SUMMARY

In any case Manfred Heckl belongs to the greatest acousticians. With his particular technical alignment and inclination he was, for engineering acoustics and noise control in the post war era, a stroke of luck, the right man at the right time. With his pioneering work he essentially helped us to make great progress in technical noise control and thus contributed to what Inter-Noise 2016 has chosen as theme of the conference: to improve our technical/physical understanding and our respective tools and thus to move “towards a quieter future”.

But let me finish with a sentence which one of the guests at Manfred Heckl’s last working day party had chosen as farewell: Of course praise, respect, gratitude and admiration are a necessary and therefore sometimes questionable element of each encomium - but in the case of Manfred Heckl all of this is true!

MANFRED HECKL MEMORIAL SESSION

The huge impact of Manfred Heckl’s work and influence justifies a reminding event. Being aware of the emphasis he had given to noise control and noise control problems, the coincidence of an Inter-Noise conference on noise control engineering in Germany with the 20th anniversary of Manfred Heckl’s death offers an ideal, compelling platform for reminding, reviewing and honouring him and his works. Thus, a Manfred Heckl Memorial Session has been organized for Inter-Noise 2016 in Hamburg, where various authors and presenters will look back to the work and activities of Manfred Heckl and try to assess their value and impact from the distance of 20 years.

Following this event, the various presentations and contributions given there will be made available by a booklet which can be found and downloaded then from the website given in [1].

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