A Glimpse on Gerhard Brewka's Contributions to Artificial Intelligence

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Abstract. Gerhard Brewka has made a remarkable impact on artificial intelligence, especially in the area of knowledge representation, through his ideas, collaborations and mentoring, always amazing those close to him with his ability to inspire. This short paper offers a glimpse into four areas of research where Gerd's imprint has been particularly distinct, intertwined with personal recollections of the authors, and with comments on those of Gerd's personal characteristics that make his research perspectives so appealing to others.

1 Introduction

"To continue in one path is to go backward." – Igor Stravinsky

Gerhard Brewka has made a distinct mark on the field of artificial intelligence through his pioneering research ideas, fruitful collaborations with many colleagues, deep influence on his students, and dedicated service to the broad AI community in high visibility and high impact roles. This article will provide an overview of Gerd's professional contributions, focusing on his research. But along the lines we will comment on those characteristics of Gerd that make him an inspiring colleague, friend and mentor. The four of us have been beneficiaries of Gerd's ideas, enthusiasm and friendship. By writing this article and editing this volume we hope in some small way to show our gratitude and appreciation.

Gerd's research covers a spectrum of problems central to AI that concern knowledge representation and reasoning. All of his endeavors addressed problems that were both fundamental and in urgent need of solutions. Importantly, he was able to connect disjoint ideas, for instance developing an integrated perspective on preferences and nonmonotonic reasoning, or proposing nonmonotonic multi-context systems. And throughout his career, Gerd's cutting-edge research has always been a source of inspiration for many researchers and students.

In order to reflect the multitude of Gerd's influential work, this paper is grouped into four sections corresponding roughly to those research areas where his ideas and contributions were felt the most. We start by reviewing Gerd's work in the area of reasoning about actions and change (done by Hannes) and follow

that with an account of his work in argumentation (naturally, done by Stefan). Section 4 gives an account of Gerd's record in the field of nonmonotonic reasoning (by Thomas). Gerd's ideas and contributions to the topic of preferences in AI (recollected by Mirek) concludes that brief tour. We must emphasize, however, that this tour is not an encyclopedic enshrinement of Gerd's contributions and achievements; rather it stops at some of the many pieces of a beautiful gallery, subjectively chosen and with personal commentaries and memories – doing it differently would have been very difficult if not impossible.

2 Reasoning about Actions and Change

An early, yet influential, work of Gerd was the article "How to Do Things with Worlds" in the *Journal of Logic and Computation* that he wrote together with Joachim Hertzberg [37]. The work started out with a critique of previous approaches to model the changes induced by actions proposed by Ginsberg and Smith [57] and Winslett [86]. Gerd and Joachim Hertzberg managed to show that the approach of Ginsberg and Smith was syntax-dependent, and that Winslett's method of measuring the distance between worlds incorporated no notion of causality and thereby allowed for unintuitive conclusions. In the paper, they put the possible-models approach on a firm semantic basis that is insensitive to syntactic variants of specifications. They also provided an early treatment of indeterminate effects (indeterminate like that of tossing a coin, where the result is either heads or tails, but it is outside of the scope of the specification to say which) that had at that time only just begun to be recognized as problematic [62]. Most significantly, that paper was one of the first works in reasoning about actions to incorporate causality. It was quickly picked up by a number of researchers [67,2,85] and remains among Gerd's most cited papers to this date.

But Gerd did not just contribute to the field of reasoning about actions, he also showed how reasoning about actions can benefit other sub-fields of AI. For instance, he employed a widely used reasoning about actions formalism, Reiter's version of the situation calculus [77], to model dynamic argumentation scenarios, such as discussions or court cases [20]. There, speech acts of single agents constitute the actions that influence the state of the world, that is, the current state of the dynamic argumentation scenario. Gerd explicitly formalized rules of order, and also allowed meta-argumentation about these rules (and meta-meta-argumentation up to arbitrary depth).

Together with Steven Shapiro, Gerd also investigated dynamic interactions between goals and beliefs [78]. It was standard practice in the agent/planning literature that an achievement goal (a goal to make a formula true) should be dropped when the agent comes to believe that the goal cannot be achieved any more. Gerd and Steven Shapiro extended this to an approach where, if at some point in time the beliefs of the agent change such that the goal becomes achievable again, then the agent can readopt the goal.

While reasoning about actions was probably not Gerd's main research area, he still made significant contributions and helped shape the field. In 2008, Gerd

and my PhD supervisor Michael Thielscher (who was then at Dresden University of Technology) started a joint DFG[1] project on defaults and preferences in action formalisms. I was employed as a research associate in Dresden by that project and so came to know Gerd as our project partner. Due to the topic of my dissertation (default reasoning in action theories), it quickly became clear that Gerd would be the second supervisor of my PhD. After the conclusion of the project (culminating in a joint KR paper [5]), he offered me a position as a (post)doctoral researcher in Leipzig, which I gladly accepted and have held since. *So happy birthday Gerd, and thanks for everything!*

3 Argumentation

Formal Argumentation has been one of the success stories in the the recent history of Artificial Intelligence (AI) [8] and is nowadays a vibrant field at the intersection of computer science, philosophy, linguistics, and several application domains the most prominent of which certainly is legal reasoning [7]. Within AI, several subfields are particularly relevant to – and benefit from – studies of argumentation, in particular knowledge representation, nonmonotonic reasoning, and multi-agent systems. Argumentation studies how to model arguments and their relationships, as well as the necessary conflict resolution in the presence of diverging opinions, thus providing a general and formal treatment of several fundamental questions arising in various applications. A particular branch of argumentation is called abstract argumentation (or Dung's argumentation named after the inventor of abstract argumentation frameworks [50]), where the conflict between arguments is resolved by abstracting away from the arguments' contents, yielding a simple yet powerful framework for reasoning.

Taking Gerd's manifold interests in AI and knowledge representation into account, it is not at all surprising that he also contributed to argumentation. In fact, Gerd's most cited article [12] on preferred subtheories is referred to in many argumentation papers, since it explicitly deals with issues highly relevant to the field, namely inconsistency management in the light of preferences.[2] Another relevant paper is the one on dynamic argument systems [20], which has been already discussed above. Finally, also directly related to argumentation is a novel proposal to combine argumentation and multi-context systems [31].[3]

In what follows, I will focus on Gerd's contributions to the field of argumentation in the last five years, a period wherein I had the pleasure to work jointly with Gerd.

Abstract Frameworks become Dialectical. During a Dagstuhl meeting on Belief Change in 2009, Gerd and I recognized that we share some thoughts about how to generalize Dung's abstract argumentation frameworks. Indeed, several such

[1] Deutsche Forschungsgemeinschaft, the main national agency to fund basic research in Germany.

[2] More comments on that paper are in Section 5.

[3] Multi-context systems in Gerd's work are discussed in Section 4.

generalizations were already around that time (bipolar frameworks or set-attack frameworks to mention just two prominent ones, see also the survey paper [42]), but we had the joint feeling that there should be a more uniform and simple way to express these generalizations within a single formalism. Although my memories are a bit vague, I remember that we mainly thought about employing hypergraphs for argumentation frameworks.

A few months later – I was visiting Gerd in Leipzig for three months in winter 2009 – Gerd already came up with an alternative and strikingly elegant idea for our purpose. In a nutshell, arguments come with their own acceptance conditions which explicitly state when to accept an argument depending on the status of its neighbour arguments. This not only generalizes Dung's frameworks ("accept an argument if all parents are not accepted"), but also allows to express relations which mix supporting and attacking relations. During my visit we fine-tuned the idea and came up with generalizations of all standard Dung semantics for this new framework. Typical for Gerd, he thought that he lacks background in argumentation in order to publish and sell our ideas to the community. Hence, he organized what was called Argumentation Christmas Meeting (ACM) inviting experts from the field including Henry Prakken, Tom Gordon, Tony Hunter and Leila Amgoud. The meeting was an inspiring one, with many ideas proposed. To Gerd and me it had also yet another significant outcome. The name we proposed for our formalism raised some well founded objections. Fortunately, a better one was proposed too (thanks to Tom Gordon and Tony Hunter). And so we renamed our deliberation frameworks into abstract dialectical frameworks [24,46] and the name stuck. ACM 2009 was a great event where both Gerd and I strongly benefited from the talks and fruitful discussions in the course of the meeting. Moreover, all participants enjoyed the nice atmosphere of this informal workshop and the social program including a visit to a performance of Stravinsky's *Le sacre du printemps* in the Leipzig Opera House.

Dialectical Frameworks become Mature. In the next years, some further papers on abstract dialectical frameworks (ADFs) were published including joint work with Paul Dunne [27], where we investigated how ADFs can be translated back to Dungian frameworks, Gerd's work with Tom Gordon on an embedding of Carneades in ADF [35], and several system papers [49,51,52,53].

However, it was our students, in particular Johannes Wallner (who was visiting Gerd in spring 2012) and Stefan Ellmauthaler who have found some examples where the generalizations of the semantics we have proposed do not yield intuitive results. In the meantime also Hannes Strass was working on a unifying theory of argumentation semantics [80] based on approximating operators, a technique going back to a general operator-based theory of nonmonotonic reasoning developed in [48]. All this led to a correction of semantics which has been published at IJCAI 2013 [34]. Basically, the main difference is that we switched from a purely two-valued definition of the semantics to a three-valued approach making use of a uniform characteristic operator as initially suggested by Hannes Strass. Further semantics for ADFs have recently been proposed by Sylwia Polberg [73] and by Sarah Gaggl and Hannes Strass [54].

The years 2010–2013 also witnessed growing groups in Leipzig and Vienna working on Argumentation. While Ringo Baumann and Gerd did several works on enforcing in argumentation [3] and splitting [6] including a joint paper with Vienna [4], Hannes Strass joined the Leipzig group in 2011. In 2012, Gerd and I decided to apply for a bilateral FWF-DFG project for further pursuing the development of ADFs[4]. The project was launched in Summer 2013, giving us the opportunity to continue the work on the concept of ADFs and its applications, in collaboration with our second generation of PhD students.

The much Gerd and I enjoyed the excitement and commitment our students and local colleagues showed to further develop ADFs (see e.g., [74,65,81,82,83]) we still were slightly disappointed that ADFs – although cited quite often – were not used by other scientists from the field. One possible explanation is that due to the abstract notion of ADFs, tailored instantiations techniques are required to show their potential. During my second visit in Leipzig in winter term 2013, we thus have worked on a higher-level interface to formalize acceptance patterns (for instance, "accept argument a if more supporting arguments for a are accepted than arguments attacking a"). These abstract patterns are then associated to arguments and finally "compiled down" automatically taking the actual structure of the ADF into account. As a result, the rather technical notion of acceptance condition is thus hidden from the user who now directly works with a general semantical framework for assigning a precise meaning to labelled argument graphs. These ideas were first presented by Gerd's invited talk "Abstract Dialectical Frameworks and Their Potential for Legal Argumentation" at JURIX 2013 and have then been published at ECAI 2014 [47].

My second visit to Leipzig also allowed me to attend Ringo Baumann's PhD defense. As Pietro Baroni (as a neutral outsider) will agree, the party afterwards is something one should not have missed indeed! Seriously speaking, Ringo's thesis on various aspects of abstract argumentation and the fact that it received a honorable mention for the ECCAI Artificial Intelligence Dissertation Award in 2014 underlines that Gerd is not only a world-wide renowned researcher but also a great advisor and teacher.

Conclusion. Besides all the enjoyment during our scientific achievements, I will always remember the hospitality Gerd and his family offered; especially our joint visits to the stadiums of Borussia Dortmund and 1. FC Köln are memories that will never be forgotten. *Danke für alles und die besten Wünsche!*

4 Nonmonotonic Reasoning

Nonmonotonic reasoning became an exciting and hot research area in the mid 1980s, after the seminal works of Ray Reiter [76], McDermott and Doyle [70], and McCarthy [68] had been published in 1980, the *Annus Mirabilis* of the field.[5]

[4] See `http://www.dbai.tuwien.ac.at/research/project/adf/`.

[5] Cf. the Annus Mirabilis in Physics (1905) owing to several fundamental works of A. Einstein.

The need for nonmonotonic reasoning capabilities had been widely recognized, and a whole range of research issues opened up, with lots of challenges and opportunities for a young researcher. After joining in 1984 the *Gesellschaft für Mathematik und Datenverarbeitung (GMD)* in St. Augustin, a major research facility on Applied Mathematics and Computer Science in Germany at that time, Gerd thus started working in this field and published first papers [10,11], followed soon by further papers on different subjects.

In this early period of Gerd's work on nonmonotonic reasoning, there are two outstanding and influential contributions, namely his preferred subtheories [12] and his cumulative default logic [13]. Preferred subtheories are a simple yet powerful approach to cater for nonmonotonic reasoning on top of "classical" knowledge bases. An account of the latter is left to Section 5, where first-hand experience and reactions to the presentation of the paper are reported; we focus here on cumulative default logic.

In his critical analysis of Reiter's work, Gerd noticed that the way in which Reiter's approach arrives at conclusions (which, as Reiter explained to us in personal communication was well deliberated) had a weakness, in that assumptions (in technical terminology, justifications) that are made to apply default rules are local and not necessarily respected later in the proof (i.e., derivation) of a consequence from a default theory; this permits one to make contradictory assumptions at different steps of a derivation. To even this out, Gerd proposed a refinement of default logic which keeps track of assumptions in derivations. Notably, the resulting logic satisfies the following property: if from a stock K of knowledge we can infer x, then we can infer y from K if and only if we can infer it from $K \cup \{x\}$, i.e., a "lemma" x can be added without affecting derivability of y. This property, known as *cumulativity*, is missed by Reiter's formalization, and it was Gerd to term his approach *cumulative default logic (CDL)*. Among the many variants and refinements that default logic has seen over time, CDL is still the most striking and important.

A milestone in Nonmonotonic Reasoning was Gerd's book *Nonmonotonic Reasoning: Logical Foundations of Commonsense* [14] which was based on his PhD thesis, that he successfully defended in 1989. This was in fact among the first books in the field presenting the "classical" approaches to nonmonotonic reasoning coherently in one text,[6] and it enriched them with Gerd's contributions on CDL, preferred subtheories and further results. It also included inheritance networks, which were popular at this time, as well as a brief glimpse on conditional logic; and typically for Gerd, the book was closed by a critical chapter reflecting on the achievements and issues to be addressed, well-thought.

Fueled by the interest in Gerd's work, he was invited to the *International Computer Science Institute (ICSI)* in Berkeley, California, where he spent a year from 1991 to 1992 with his family; he there had the opportunity to exchange ideas with people in the Bay Area and US researchers who were working at the very frontier of this field, and to turn to new subjects. In the sequel he developed an interest to branch out in formalisms and inference methods, and in particular to

[6] The book [66] appeared slightly earlier.

non-monotonic logic programming and abductive reasoning [15,37,38], belief revision [87], actions and change [37] (see Section 2) but also towards argumentation [18]; furthermore, in the use of preferences in nonmonotonic logic [16,17].

I remember well when I met Gerd for the first time, which was in 1992 in Vienna, where he was visiting and gave talks at our department. He presented nonmonotonic reasoning in a superb lecture to the faculty and in a further talk his work on preferred subtheories to the specialists, which was inspiring for our research. Already on this first encounter, I could experience some features of Gerd which he has proven later many times: first, that he is an excellent communicator capable of conveying difficult results and material well to a broad audience; many talks and papers witness this. Second, that he is a good listener and open to comments, reflecting on them to improve his work. And third, that vice versa Gerd is concerned with providing useful comments on the work of others, to question and deepen it for the best of scientific progress. As an episode of the latter, I remember well that Gerd asked Georg Gottlob, who presented in a seminar during Gerd's stay in 1992 a translation of Reiter's default logic to Moore's autoepistemic logic [71], whether it could be modified to achieve modularity; indeed, this led Georg to come up with a proof that this is in fact impossible [60], using a smart proof technique which was used as a blueprint then by others for establishing similar impossibility results.

Notably, our faculty at Vienna University of Technology was impressed with Gerd's work and the rector offered him the newly created chair of knowledge-based systems, which he took over in 1995; for personal reasons, however, he could regretfully stay only a short time in Vienna before he moved 1996 to Leipzig, where he still works at the University.

Gerd's line of work in nonmonotonic reasoning continues with important contributions on well-founded semantics, already in combination with preference information [19,36]. The issue of preference handling for nonmonotonic formalisms, and in particular for logic programs had gained increased importance for him and he devoted much time and efforts thinking about it. An episode in that period which nicely exemplifies Gerd's reflection on the comments of others is our joint work on preferences [28,29]. It were some review comments on his idea to capture preferences on rules of an answer set program which made Gerd think about addressing the problem at a more systematic level and to present, in the spirit of the AGM Theory in belief revision [1], principles that any semantics for preferences on non-monotonic logic programs should satisfy. These principles and the way of looking at the problem had a major impact, and it led to a number of follow up works; only most recently, a PhD on this subject has been completed in which the study of principles has been advanced, reconfirming the value of the idea and of certain principles in the seminal paper [79].

Over the years, Gerd's interest and work on preferences has then further intensified such that a whole section (Section 5) ought to be designated to this stream of work. Furthermore, he also revived his interest in argumentation [20,43] which later has grown into a stream of contributions in this field that is also

considered separately (see Section 3). Clearly, nonmonotonic behavior was always an issue there, as well as with other problems which Gerd studied.

In the past decade, Gerd's work includes one line that should be highlighted here, viz. his important contributions on multi-context systems. Rooted in seminal work of McCarthy on contexts [69], the Trento School around Fausto Giunchiglia and Luciano Serafini had developed a formalism to combine local knowledge bases called "contexts" in a global system interlinked with special bridge rules [56,58]. Later Serafini and colleagues aimed at allowing negation in bridge rules, and it was Gerd who helped them to get this right [44]. Intrigued by the idea he then proposed to develop a more abstract framework of multi-context systems [30] that allows for heterogeneous contexts with possible nonmonotonic semantics, modeled by families of belief sets, and bridge rules with nonmonotonic negation; the global semantics is defined strikingly simple in terms of an equilibrium over local states, akin to (but different from) notions in game theory. Our group in Vienna has followed up on this framework in research projects, in this course of which several joint works with Gerd have been published [31,32,33,25]. Most recent work on supported MCS [84] and evolving MCSs [59] shows the interest of other groups to develop this notion further.

Talking to Gerd has always been a pleasure, and I have enjoyed the privilege to work with him very much, be it on research or any other matters. Furthermore, it was always great fun to be out with Gerd or to meet him at home; he and Anni are perfect hosts and they served the greatest and most memorable asparagus soup of my life!

Thank you so much for all this Gerd, and on behalf of all who are in Nonmonotonic Reasoning and related topics, the very best wishes on your 60th birthday, and remember: you can't always get what you want, but if you try sometime you get what you need...

5 Preferences

In 1989 Gerd wrote a paper with the title *Preferred Subtheories: An Extended Logical Framework for Default Reasoning* [12].[7] The main goal of that paper was to introduce a new formalism for nonmonotonic reasoning. The formalism was striking because of its simplicity, on the one hand, and its generality, on the other. A theory in this formalism was a sequence of sets of gradually less and less *preferred* formulas. The theory imposed on interpretations a certain total preorder and those interpretations that were maximal with respect to this preorder were regarded as intended (or preferred) models of the theory. Despite its natural simplicity, the formalism turned out to be quite powerful, generalizing several other nonmonotonic logics, most notably the THEORIST by Poole [75]. While a milestone in nonmonotonic reasoning, we mention the formalism here

[7] The paper was presented at IJCAI 1989 in Detroit. I attended the presentation and later talked to Gerd. That was when we first met. At that time I did not realize that our paths will intersect so many times and so closely in the future.

as it marks Gerd's first foray into the area of preference reasoning, an area that became one of his major fields of interest.

Gerd's original interest in preferences was driven by a strong sense of deep and multifaceted connections between nonmonotonicity and preferences. First, at the most basic level, nonmonotonicity arises in commonsense reasoning because we view some models as unlikely and restrict attention only to some, for instance, to minimal ones as in circumscription [68]. Any preference relation on models, derived in some way from the knowledge we have at our disposal or simply decided upon by the reasoner, gives rise to a nonmonotonic entailment relation. Thus, nonmonotonicity can be studied through preference relations. Second, in the context of specific reasoning systems, with default logic [76] being a prime example, we often face the problem of multiple extensions. These extensions result from choices about the order in which defaults are to be applied or, to put it differently, from priorities assigned to them. As before, these priorities can be inferred, for instance, by means of the specificity principle [72,64,63], or they can be selected by the reasoner.

Much of Gerd's research on preferences in nonmonotonic reasoning focused on this latter approach. His 1991 paper, written jointly with Ulrich Junker, introduced the prioritized default theories in which defaults were explicitly ordered, and proposed the notion of an extension for such theories [61]. Later papers [16,17] expanded these ideas and, in particular, led to generalizations which allow one to reason about default priorities [17]. The beauty of this work by Gerd stems again from the simplicity of the formalisms proposed. Gerd argues that since non-normal defaults are seen as a means to resolve conflicts (impose priorities), in formalisms that explicitly incorporate preferences it is justified to restrict attention to the case of normal defaults only! That "design choice" led Gerd to strong results and an elegant theory.

Nevertheless, in some settings, for instance in logic programming and extended logic programming [55] non-normal defaults are essential. Around the mid-1990s, Gerd turned his attention to these formalisms and considered extensions in which program rules were ordered. The goal was to propose formalisms in which preferences could be expressed directly in the language and could be derived dynamically. His first paper on this topic was concerned with extended logic programs under the well-founded semantics [19]. Gerd described there an extension of the language of extended logic programs to accommodate preferences, and defined a modification of the well-founded semantics extending the original one by taking preference information into account. He then illustrated the effectiveness of the formalism in the domain of legal reasoning. A natural next step was to develop a similar treatment for extended logic programs under the answer-set semantics. Gerd undertook this project jointly with Thomas Eiter. The resulting paper [28] is one of the milestones in the study of preferences in nonmonotonic formalisms. It gives a comprehensive analysis of the problem and presents a particular way to treat preferences on program rules. However, its most important contribution is to cast the problem in terms of general and abstract postulates any satisfactory treatment of preferences should satisfy. Gerd and

Thomas formulated two such natural postulates and showed that, unlike earlier attempts at formalizing preferences in nonmonotonic formalisms, their proposal satisfied both.

The advent of the new millennium marked the emergence of new directions in Gerd's study of preferences. The first of them was based on an observation that multiple models (extensions) of (nonmonotonic) logic theories are often caused by the use of disjunction. If that disjunction was "ordered" to indicate the preferred disjunct (the preferred way in which to satisfy the disjunction), it would lead to the notion of a preferred model. Working with Salem Benferhat and Daniel Le Berre, Gerd built on this idea to introduce the *qualitative choice logic* [26] and described the precise semantics of statements involving *ordered disjunction*. Since disjunctions in the heads of logic programs are also responsible for multiple answer sets, the idea of an ordered disjunction also applies there. Gerd, later joined by Ilkka Niemelä and Tommi Syrjänen, proposed and studied the corresponding version of logic programming called logic programming with ordered disjunction [21,39].

The second direction was concerned with the design of modular and flexible languages to represent constraints and preferences. The first such modular language of *answer-set optimization* programs was proposed by Gerd in a joint work with Ilkka Niemelä and me [40]. It started in 2002, with a talk on preferences Gerd gave at the Dagstuhl Seminar dedicated to answer-set programming. Both Ilkka and I had commented upon it. Gerd saw a way to incorporate our comments into his way of thinking and proposed a collaboration. The basic idea was simple. Standard logic programs (or propositional theories) representing hard constraints were extended by rules modeling soft constraints in terms of some conditional preference statements. In answer-set optimization programs, preference statements are used to select preferred answer sets (models) from among those that satisfy all hard constraints. Continuing that line of research, Gerd, Ilkka and I generalized these ideas in the formalism of *prioritized component systems* [41] by incorporating some ideas from CP-nets [9]. Both formalisms were quite specific. Gerd felt a more general treatment of the issue of preference language design is needed. Consequently, he suggested and offered a compelling motivation for a general template of a preference description language [23,22]. Finally, in yet another related effort, in a joint work with Stefan Woltran and me, Gerd proposed a general language to describe preference orders on subsets of some ordered domain [45].

This brief account of Gerd's work on preferences can hardly do justice to the impact it had on the field. I hope at the very least it shows the breadth of scope and the depth of the insight. I feel fortunate to have had a chance to work with Gerd. To use a phrase that Gerd may recognize, this cooperation has been something I would not want to miss! Even more, I very much hope for more. *Best wishes, on your 60th birthday, Gerd.*

6 Conclusion

In this paper, we gave a brief account of Gerd's contributions to AI. While clearly subjective and of necessity non-encyclopedic, our overview nevertheless showcases Gerd's manifold contributions in several diverse areas he studied.

As we already have said earlier, Gerd is a great listener while, on the other hand, his comments and opinions are highly valued by his peers. He has a strong social attitude and is concerned with enabling scientific exchange and collaboration. It is thus not surprising that Gerd has served the scientific community throughout his career in many ways. Even in an early stage and as a young researcher with little institutional support, he was lecturing in the 1980s on Nonmonotonic Reasoning at the KIFS, the German Spring School on AI, he organized the (German open) Nonmonotonic Reasoning Workshop in Bonn in 1989, very well attended by international researchers, and pushed the Dutch-German Nonmonotonic Reasoning Workshop series. Furthermore he founded and was heading the German special interest group (SIG) in Nonmonotonic Reasoning. Gerd later expanded his service to the emerging KR community, and then all of AI in roles such as a chair of many meetings, including KI, LPNMR, KR, and ECAI, with ICJAI 2016 being next in row. He has also served as a member of review and advisory boards, and as head of major organizations in the field, including assignments as President of ECCAI and President of KR, Inc. This service makes him a research facilitator and adds to his scientific merits.

We very much hope that he continues this success story – *all the best, Gerd!*

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