LAUDATIO
Laurea magistralis honoris causa *in Physics*
conferred by the University of Camerino
to ***Prof. Dr. Peter Hänggi***

Rector,

Pro-rector

Esteemed members of the Senate of the University of Camerino,

Dear Colleagues and Students,

Ladies and Gentlemen,

It is a great honor for me, as the successful World Year of Physics 2005 comes to an end, to say a few words about the life and the work of Dr. Peter Hänggi. I am convinced that today's celebration is significant not only for the members of the academic body of our University, but also for the entire scientific community of our country.

Dr. Hänggi has made pioneering work in the development of non-equilibrium statistical physics, and its applications to biology and nano-technology. He has decisively contributed to the understanding of the role of microscopic fluctuations in the operation of small natural and artificial systems, including the molecular machinery of the cell and the most recent engineered nano-devices.

Peter Hänggi was born in Bärschwil, a small village on the border between French and German speaking Switzerland. He studied physics, mathematics and physical chemistry at the University of Basel, where he graduated in 1977 under the guidance of Professor Harry Thomas. After years of postdoctoral work in the group of Professor Hans Frauenfelder in Urbana, Illinois (1977/78), of Professor Hermann Haken in Stuttgart, Germany (1979), and of Professor Kurt Shuler in San Diego, California

(1980), he accepted in Fall 1980 an assistant professorship at the Polytechnic Institute of New York. There, he was promoted to associate professor (with tenure) in 1983.

At the remarkably young age of only 34, he was offered a chair of theoretical physics at the University of Augsburg. There, first physics professor, he founded a new, highly successful physics department; his department presently employs 20 professors and is still growing.

Despite investing much time and labor into administrative matters Prof. Hänggi never neglected his passionate engagement in basic research. Indeed, his original contributions in Statistical Physics are marked by a unique variety of cross-disciplinary fascinating ideas, by an impressive series of key discoveries and pioneering "firsts". Among his outstanding achievements are: (1) His generalization of Kramers' reaction rate theory to systems that exhibit *memory*-friction (non-markovian rate theory) and, in collaboration with Eli Pollak and Hermann Grabert, to systems at the cross-over with quantum tunneling (the PGH-theory, from its authors' initials); (2) The implementation of the *periodic-orbit theory* of Martin Gutzwiller for *dissipative quantum systems* at all temperatures. These two seminal contributions are universally credited to him; and, furthermore: (3) The discovery of the *coherent destruction of tunneling*, a quantum mechanical phenomenon of widespread application at the molecular and nano-scale, such as for the control of de-coherence in quantum information processing. Over the last 15 years or so, his name is unmistakably connected with (4) Pioneering the theoretical research on the phenomena of *Stochastic Resonance* and *Brownian Motors* (a term he coined in 1995). On these topics he co-authored three highly cited review articles presently acknowledged as "renowned classics".

The effect of stochastic resonance, first reported by Giorgio Parisi and coworkers, consists in the observation that an appropriate small amount of noise can in fact strongly boost a weak signal (weak information) rather than hampering it. As such, Stochastic Resonance has found wide applications in diverse contexts of physics, chemistry, engineering, and,

above all, in bio-technology, up to recent striking clinical applications in medicine. The effect of Brownian motors consists in the noise-assisted directed transport of particles and matter *per se* in systems characterized by an intrinsic or dynamically induced asymmetry. Dr. Hänggi has been a driving force in the research effort aimed at exploring the ramifications of such stochastic phenomena, both within the classical regime and – a far most demanding theoretical challenge – the nonlinear, dissipative, time-dependent quantum regime.

His research achievements have already been honored internationally at the academic level. Dr. Hänggi has been awarded the "certificate for fellowship" by the American Physical Society as early as in 1988 and has been elected for Fellowship by the Institute of Physics in 1999. Moreover, among other honors, he obtained the Nicolas Cabrera Professorship by the Universidad Autonoma of Madrid, Spain, in 1995 and the Michael visiting professorship of the Weizmann Institute of Science, Israel, in 1998. More recently, he has been elected as a member of the Max-Planck-Society in 2001; he received the Research Award by the Foundation for Polish Science in 2002, and was awarded the “Eminent Scientist Award” from RIKEN, Japan in 2003. Moreover, he has been elected a member of the oldest, most distinguished academy in Germany, The Academy of Natural Scientists Leopoldina in 2003, and a foreign fellow of the American Association for the Advancement of Science in 2005.

Dr. Hänggi international reputation is further reflected by his election into the editorial boards of many well-established, high-impact factor journals. He serves on the board of the European Physical Society: Division of ``Nonlinear and Statistical Physics''. He is a long-time board member of the German Physical Society, where he chaired the division ``Dynamics and Statistical Physics'' from 2000-2003. He also acted as adviser on several international committees in Europe, in the United States of America, and for the European Commission.

Peter is a personal friend of mine, I have known him for over 20 years now and I could recount tens of anecdotes that illustrate his exuberant

personality, his dedication to science and research, his intense relationship with the academic environment, friends and colleagues, and - ”off records” - women. But I will limit myself to the following episode. After secondary school, Peter was admitted to the Kirschgarten Gymnasium in Basel. This meant that he had to get up every morning at around 5:15 and ride his bike for 6 km up to the nearest train station, regardless of the weather conditions, to be in class on time. However, endurance and talent went hand in hand. One day, the teachers there set up a context consisting in building a wooden clock-work capable of giving the time for at least five minutes. Out of all his fellow students, Peter was the only one who succeeded in designing and assembling a ratchet device, a cuckoo-like clock, which in fact ran for over twenty minutes. That was his first prize, perhaps the most cherished of all, a substantial five ``hard” Swiss Francs in the late sixties!

This episode is revealing of Peter’s determination and creativity as a young student. His present academic success stems from his early days in high school, where he could fully express his drive for promotion both as a citizen and as a scientist and, most important of all, he found a unique step-stone in the pursuit of his aspirations. On recalling this episode, I cannot help weighing the motivations of the new teaching models our schools and universities are adopting throughout Europe and wonder whether they are best suited to kindle the civil engagement of the new generations and instill in our youngest talents the passion for the progress of science and liberal arts.

In times when academic rigor, and intellectual courage seem to decline across our society and, most lamentably yet, among the younger generations, it has been a privilege for me today, on this special occasion, to introduce to you all, and in particular, to the students and the colleagues of our University, Professor Peter Hänggi as an example of outstanding scientific achievement and personal fulfillment.

Camerino, March 20th, 2006