Laudation by Professor Emili García-Berthou on the occasion of awarding an Honorary Doctorate from the University of Girona to Professor Sovan Lek

Honorable Rector,
Distinguished Authorities,
Colleagues from the university community,

I will speak in English so that Professor Lek and the several people accompanying him will understand me, and then I will briefly summarize some of what I have said in Catalan. It is an honor and a privilege for me to summarize, in this solemn academic session, the merits of Professor Sovan Lek on this occasion granting him an honorary doctorate from the University of Girona promoted by the Department of Environmental Sciences.

Sovan Lek was born in 1952 in Cambodia. As you know, Cambodia lies between Thailand and Vietnam in Southeast Asia. It is famous for the temple complex of Angkor Wat, a UNESCO World Heritage Site built by the Khmer Empire during the 12th century. Sadly, Cambodia is also known for the Cambodian genocide committed by the Khmer Rouge, which killed more than 1.5 million people from 1975 until 1979. Professor Lek was fortunate to have obtained a B.Sc. from the University of Phnom Penh in 1974, the year before the genocide, and moved to France to pursue further studies. He obtained a M.Sc. in Hydrobiology from the University Paul Sabatier, in Toulouse (France) in 1975, and in 1978 a Ph.D. in Hydrobiology from the University Paul Sabatier under the supervision of Christian Lévêque. His Ph.D. thesis was on the biology and ecology of small characiform fishes in Lake Chad, Africa. He was an assistant professor at the University of Algiers in Algeria from 1979 to 1983 and an assistant professor at the University of Meknes in Morocco from 1983 to 1989. After that, he joined the University Paul Sabatier (Toulouse III) with his wife, Sithan Ang-Lek, who is also an ecologist and is with us here today. They spent the rest of their scientific careers in Toulouse. Sovan Lek was named a Distinguished Professor (*Professeur de Classe Exceptionnelle*) at the University of Toulouse and is now a Professor Emeritus.

Professor Lek's research has focused on the community ecology of freshwater fish and ecological modeling. Within community ecology, he has added to the understanding of how environmental factors and human perturbations, such as climate change or reservoirs, affect inland fish. Freshwater fish will undergo many changes because of climate warming and many factors. Climate change will affect water availability and the flow regime of rivers. What is more, freshwater fish dispersal is generally limited within river basins and they cannot easily adapt to climate change, and most freshwater organisms are ectothermic, or cold-blooded, and the ecological functioning of freshwater ecosystems depends markedly on temperature. Professor Lek has co-authored several of the best papers modeling the likely future effects of climate change on freshwater fish in Europe. He and his colleagues have shown that the habitats of cold-water species will decrease and may even disappear from many river reaches, whereas other species will shift their distribution, changing the overall structure of ecological communities. Professor Lek has also published many papers on the current and future ecological effects of dams and reservoirs, which are very important to society. They provide water for human consumption, irrigation and industries; they regulate floods and generate electricity. However, dams also have huge environmental impacts: they completely alter rivers' flow regimes, sediment and temperature regimes, ecosystem functioning, connectivity, and the extent of their flood plains, riparian ecosystems and wetlands. They change everything. Like our research group, Professor Lek has shown that small hydropower dams in the Pyrenees change flow regimes and affect the abundance of brown trout. He has also shown that in some of the world's largest rivers, such as the Mekong River, which starts in China and crosses Southeast Asia, dams disrupt natural seasonal river pulses, decrease species diversity, homogenize fish faunas, and favor generalist species. He has also led some large research projects in Tonle Sap Lake, which is the largest natural lake in Southeast Asia and constitutes one of the world's largest fisheries, supporting the livelihood of millions of people. Tonle Sap Lake is known for its flood-pulse character, affected by fish over-exploitation and dam construction in the Mekong River, where many hydropower reservoirs are being built or planned, like in many regions of the world, particularly in the tropics.

Professor Lek's other main research topic is machine learning and the application of advanced modeling techniques to ecological data. His three most cited papers,

published in the journal *Ecological Modelling*, are on the application of artificial neural networks. According to Professor Lek, artificial neural networks are intelligent, thinking machines, developed from artificial intelligence and working in the same way as the animal brain. They learn from experience in a way that no conventional computer can and they rapidly solve difficult computational problems. In the 1990s, Professor Lek pioneered the application of artificial neural networks in ecology, in a time when they were much more difficult to apply than they are now. Artificial neural networks are now used routinely in speech or image recognition, in chemical or biomedical research. Professor Lek has edited several books that deal with these modeling techniques, but most notably two: *Artificial Neuronal Networks: Application to Ecology and Evolution* (published in 2000) and *Modelling Community Structure in Freshwater Ecosystems* (published in 2005). Although Sovan Lek has over 250 international publications that have received many thousands of citations, many other aspects of his scientific career are important. Professor Lek has taught for his entire career mostly in Toulouse and, in recent years, he has provided many free courses in his home country, Cambodia. He has advised many students, and has obtained funding for and coordinated several European projects. He has also participated in university management (for example, director of a school of doctoral studies in Toulouse). We often forget that an academic career is much more than publications and that many other aspects, such as teaching, supervising, coordinating research groups, university management, editorial work and peer review, or outreach, are equally important. In all these aspects, Professor Lek has made many important contributions.

Nevertheless, perhaps a more decisive reason behind his nomination for an honorary degree was his leading work on many Erasmus Mundus and Erasmus+ projects of the European Commission, some of which including the University of Girona as a partner. Erasmus Mundus partnerships were cooperation and mobility programs between European and third country higher education institutions (mostly from developing countries) that included scholarships and mobility fellowships. In recent years, they have been replaced by Erasmus+ actions. Professor Lek has conceived, obtained funding for and participated in about nine Erasmus Mundus and Erasmus+ projects, five of them involving the University of Girona (UdG). I was very fortunate to participate in three of them as coordinator at the UdG: TECHNO, TECHNO II, and

NESSIE. Thanks to these three projects, led by Professor Lek, Jean-Michel Baleynaud, and Georges Zissis, respectively, the UdG received over a million euros so that about 75 students and academics could come to Girona, mostly from Asia. They included about 28 Cambodians, 8 people from China, 5 from Laos, 5 from Vietnam, 4 from Thailand, 3 from Malaysia, 2 from Indonesia, and 1 from Mongolia. They came to UdG to complete all kinds of studies or stays: at the undergraduate, master, doctoral or postdoctoral levels, or as staff. Many Asian students have obtained their master's or Ph.D. degrees at the University of Girona and are now back their home countries to share their education and research skills with newer generations and to continue their relationship with the UdG. Thanks to the NESSIE partnership, 16 UdG researchers visited New Zealand or Australia, and some researchers from Korea, New Zealand and Australia stayed in Girona. I would like to take this opportunity to thank the many people from the UdG who have helped considerably in these partnerships, notably Raquel Solà, Laura Ripoll, and others in the External Relations Office, Patricia Eyskens, then at the Polytechnic School, and many academics including Dr. Albert Turón, Dr. Quim de Ciurana or Dr. Gerard Arbat. Although for me these partnerships entailed a lot of work that is not necessarily valued in academia, they were a real milestone in my career and enriched my personal experience. They were rewarding in terms of learning about new cultures and landscapes and helping people. I know that they were enriching for many other UdG staff and in particular for the many Asian people involved. The Erasmus Mundus partnerships were eventually replaced by Erasmus+ actions. Dr. Helena Guasch at the UdG recently led one called UNICAM to implement a master's of science in sustainable agriculture in Cambodia. In addition, Professor Lek is leading one called CONSEA to implement a master's program in aquatic biodiversity and conservation and a Ph.D. program in sustainable ecosystem management in Southeast Asia, also with the participation of the UdG, coordinated by Dr. Anna Vila-Gispert. All these partnerships and actions were promoted and made reality largely by Professor Lek, who opened many doors of Asia to the UdG. Cambodia is still one of the world's poorest countries (among the 47 least developed countries, according to the United Nations) and an important motivation of Prof. Lek's activity has been always to improve Cambodia's educational and research quality and to give back to his home country what he obtained in France. Certainly, he has unselfishly succeeded in doing so and, at the same time, has benefitted Girona and its university.

I ara, el breu resum en català. El professor Lek ha publicat més de 250 treballs en revistes internacionals, sobretot en ecologia de comunitats de peixos continentals i en l'aplicació de tècniques noves d'anàlisi, com ara les xarxes neuronals artificials, a les dades ecològiques. Però també té moltes altres contribucions tant o més importants, com ara la millora de la recerca i del coneixement ambiental en països en desenvolupament com Cambodja, el seu país d'origen. També ha promogut, i en bona part liderat, nou projectes Erasmus Mundus i Erasmus+, en cinc dels quals ha participat la Universitat de Girona. Gràcies a aquests projectes la UdG ha rebut més d'un milió d'euros amb els quals més de 75 estudiants o acadèmics asiàtics han vingut a la UdG per tal de fer estudis de grau, postgrau o recerca, i més de 16 investigadors de la UdG han fet estades a Àsia, Austràlia i Nova Zelanda.

Aquest doctorat honorífic també és oportú perquè el govern català va aprovar que el 2019 celebrem oficialment el centenari del naixement del professor Ramon Margalef, un altre ecòleg, i perquè cada any el dia 9 de maig, com avui, és la Diada d'Europa. Ramon Margalef és àmpliament considerat l'ecòleg més influent que l'Estat espanyol ha tingut i un altre exemple, com el professor Lek, que tot i que les publicacions internacionals són el producte principal d'investigació dels científics, hi ha altres aspectes encara més importants per ser molt influents, com ara els llibres, la supervisió d'estudiants, l'ensenyament universitari, la col·laboració internacional i la transferència de coneixement. Els professors Margalef i Lek són també exemples que la investigació ambiental i ecològica és més important que mai en un món canviant, que té molts problemes ambientals i socials. Amb aquest doctorat honoris causa al professor Lek, la Universitat de Girona celebra el centenari del naixement del professor Ramon Margalef i ajuda a reconèixer la importància de la cooperació i l'educació universitària als països en desenvolupament, la col·laboració europea i internacional, la recerca ambiental i la conservació de la biodiversitat. És, doncs, per tot això, Rector Magnífic, que sol·licito que s'atorgui i es confereixi el grau de doctor honoris causa al professor Sovan Lek.

Dr. Emili García-Berthou
Girona, 9 de maig de 2019