Young Career Focus: Professor Laurean Ilies (The University of Tokyo, Japan)

Background and Purpose. SYNFORM regularly meets young up-and-coming researchers who are performing exceptionally well in the arena of organic chemistry and related fields of research, in order to introduce them to the readership. This Young Career Focus presents Professor Laurean Ilies (The University of Tokyo, Japan).

Biographical Sketch

Prof. L. Ilies

Laurean Ilies was born in the county of Transylvania, Romania, the land of mythical vampires, where he studied chemistry at Babes-Bolyai University for two years, before relocating to Japan in 1999 with a scholarship from the Japanese Government. After spending arguably the toughest year of his life learning the Japanese language, he was admitted to The University of Tokyo, where he graduated from the department of chemistry in 2004. He continued his graduate studies at the same university under the supervision of Professor Ei-ichi Nakamura. During this period, he worked on the development of new synthetic methods for π-conjugated molecules, such as a metalative cyclization reaction to create libraries of benzoheterole-containing conjugated molecules. He also investigated the properties of these compounds and designed new *p*-type and *n*-type organic semiconductors for OLEDs. This work earned him a Ph.D. in 2009, and several prizes such as the Incentive Award of the Graduate School of Science (awarded for the best thesis), and the Japanese Society for the Promotion of Science (JSPS) Fellowship. In 2006, he spent several months as a visiting researcher at the University of Chicago (USA), where he worked with Professor Rustem Ismagilov.

In 2009, he was appointed assistant professor at The University of Tokyo, where he continued his collaboration with Professor Ei-ichi Nakamura. His research interest shifted towards the development of sustainable catalysis using base metals such as iron, cobalt, manganese, etc., and with a focus on step-efficient reactions such as C–H activation, annulation, etc. This research earned him several prizes, among them the Banyu Chemist Award (2014), Thieme Chemistry Journals Award (2015), the Young Scientists' Prize from MEXT (2015), and the Incentive Award in Synthetic Organic Chemistry (2015). In 2014, he was promoted to associate professor.

INTERVIEW

SYNFORM *What is the focus of your current research activity?*

Prof. L. Ilies I am working on the creation of new catalysts based on base metals, especially iron, and their application to step-efficient reactions such as C–H functionalization, annulation, etc. I am also interested in the design and synthesis of conjugated molecules for materials science.

SYNFORM *When did you get interested in synthesis?*

Prof. L. Ilies My love for chemistry started from junior high school, and from that early time my image of chemistry was 'making stuff'. It helped that I was allowed to fool around in the school's lab and do simple experiments (and somehow I managed not to burn it down). During high school I became fascinated by alchemy, and those stories forged my passion for creating new molecules, and for finding new ways to make them.

SYNFORM *What do you think about the modern role and prospects of organic synthesis?*

Prof. L. Ilies The modern world is abundant in synthetic molecules, plastics, clothes, drugs, semiconductors, etc., and therefore, it is only natural that the role of organic synthesis will continue to grow. In my opinion, organic synthesis will (and should) aim towards efficiency (yield, selectivity, step-,

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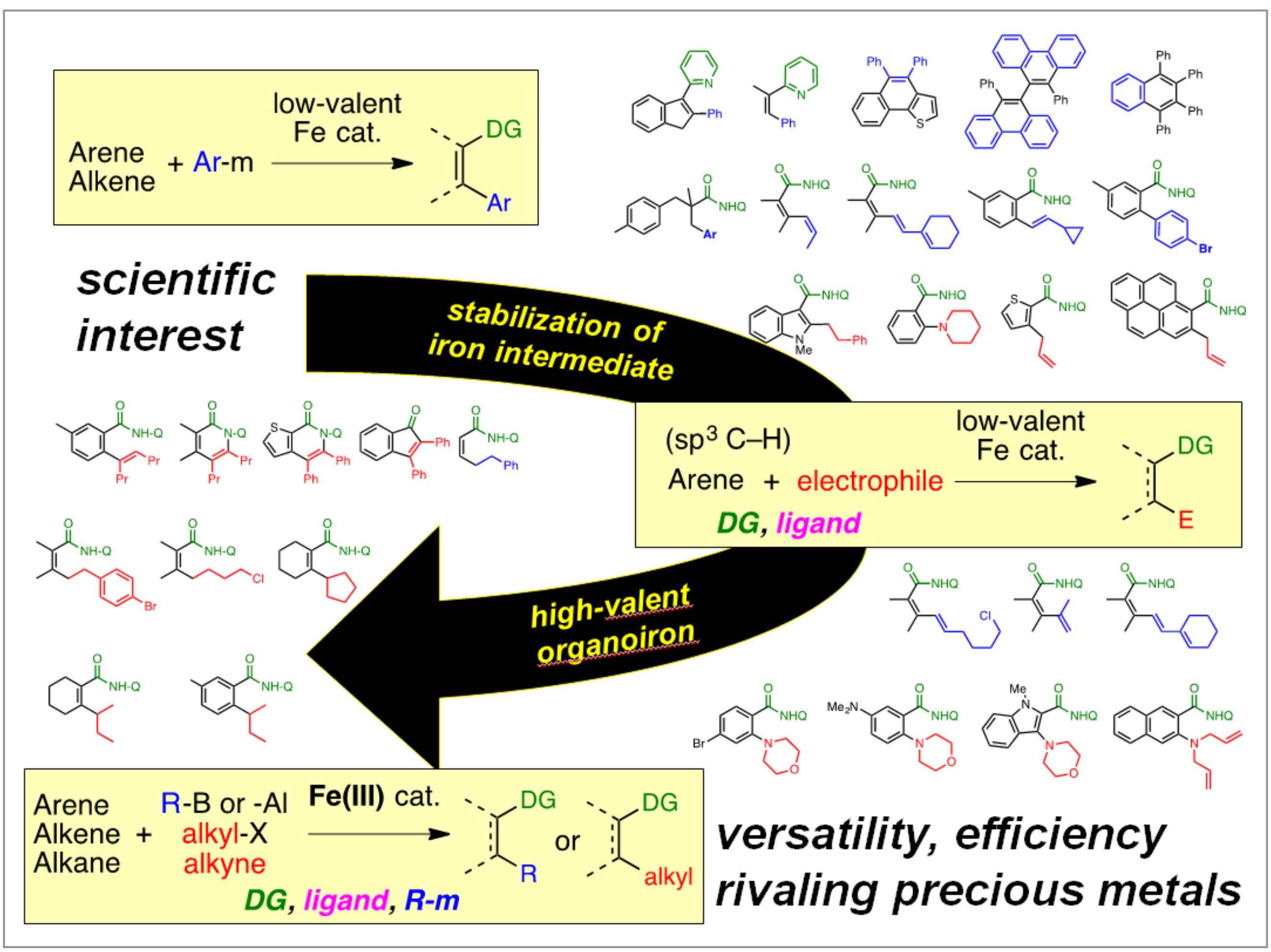
and atom-economy) and sustainability (green chemistry). Conjugated organic molecules will become more and more important for materials science, and organic synthesis will have to follow suit with the development of synthetic methods to construct complicated π-architectures.

SYNFORM *Your research group is active in the areas of novel synthetic methods and catalysis. Could you tell us more about your research and its aims?*

Prof. L. Ilies A main motif of our research is the development of base metal catalysis. We have been particularly active in the area of iron catalysis, because this is the most abundant transition metal, and it is dirt-cheap and virtually non-toxic. We developed an efficient iron catalyst for directed C–H bond activation, but we also explored other reactions such as annulation to make phenanthrenes and naphthalenes, arylation of alkenes at the allylic C–H, and oxidative C–N bond formation. We were also among the first to develop cobalt catalysis for C–H bond activation, in 2011.

SYNFORM *What is your most important scientific achievement to date and why?*

Prof. L. Ilies We struggled for a long time to develop an efficient and versatile iron catalyst for C–H activation. The problem was that we were using an organometallic reagent (zinc or magnesium) as a base, and this was reducing iron to unknown low-valent, highly reactive organoiron species (or a mixture thereof). After much frustration, we learned that a bidentate quinolylamide and a diphosphine ligand possessing a conjugated backbone can stabilize the organoiron species, and by using a milder organometallic reagent such as organoboron or aluminum, we could develop an efficient high-valent iron catalyst. This catalyst enabled a variety of C–H activation reactions such as the reaction of arene- or alkeneamides with vari-



ous organoboron or aluminum compounds with high catalyst turnover, and the reaction of various amides with electrophiles such as alkyl halides, alkanol derivatives, and alkynes.