# Young Career Focus: Professor Pablo Barrio (University of Valencia, Spain)

**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 Pablo Barrio (University of Valencia, Spain).

## Biographical Sketch

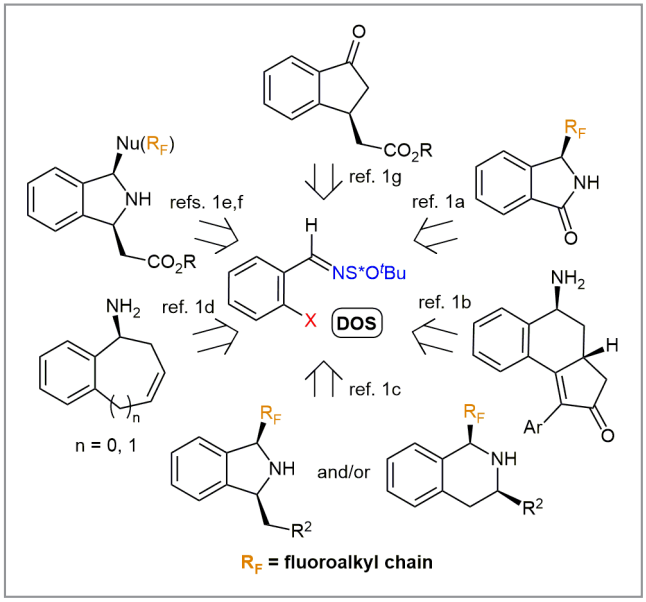
*Prof. P. Barrio*

**Pablo Barrio** was born in La Coruña (Spain) in 1979. He studied chemistry at the University of Oviedo (Spain), obtaining his PhD under the supervision of Professor Barluenga. Later, he joined the group of Professor Carreira at ETH Zurich (Switzerland) where he worked as a post-doctoral fellow for two years. Afterwards, he was granted a *Juan de la Cierva* fellowship in the group of Professor Fustero at the University of Valencia (Spain) were he has been working since 2009. He is focused on two topics: the asymmetric synthesis of benzo-fused carbo- and heterocycles using a DOS approach and the chiral Brønsted acid catalyzed allylboration reaction. He is also interested in the use of terphenyls in medicinal chemistry. He has carried out short (2–3 months) stays at Trinity College Dublin (Ireland), Max Planck Institute (Mülheim an der Ruhr, Germany), Gakushuin University (Tokyo, Japan), University of Southern California (Los Angeles, USA) and University of Louisville (Kentucky, USA). He is author of 21 publications in high impact factor journals and has mentored two PhD theses. In 2015 he received the Thieme Chemistry Journals Award.

## INTERVIEW

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

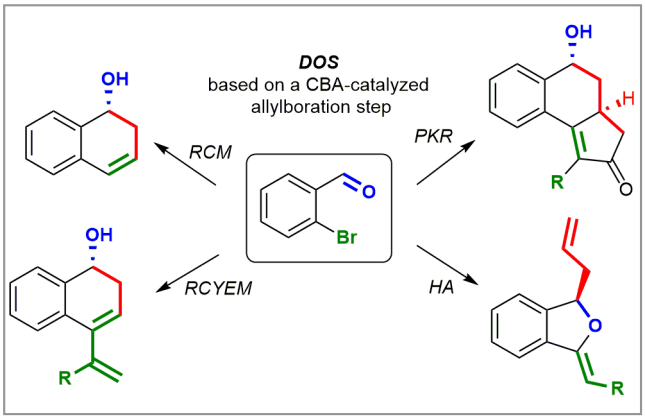
**Prof. P. Barrio** Currently, we are active in three main research areas. The first two are closely related to each other, while maintaining their independence. More specifically, for the last five years we have been studying the use of *ortho*-halobenzaldehyde-derived Ellman's imines in the context of Diversity-Oriented Synthesis (DOS).[1] We have shown that these compounds are outstanding starting materials for the rapid construction of benzo-fused carbo- and heterocyclic amines in a stereoselective manner. The presence of a halogen at the *ortho* position allows the introduction of appropriate




**Scheme 1** DOS strategy from 2-halobenzaldehyde-derived Ellman's imines

functional groups, by means of well-established palladium-catalyzed cross-coupling chemistry, in the proximity of the reacting center for subsequent cyclization reactions (Scheme 1).

Related to the aforementioned project, we have also studied the reactivity of *ortho*-functionalized benzaldehydes.[2] Specifically, we have studied the performance of such substrates in the chiral Brønsted acid catalyzed allylboration reaction. Furthermore, we have carried out a similar DOS approach, obtaining a number of benzo-fused carbo- and heterocycles (Scheme 2).




**Scheme 2** Chiral Brønsted acid catalyzed allylboration of *ortho*-functionalized benzaldehydes

Lately, we have changed our approach to achieve densely functionalized products, suitable for further derivatization; while we previously used ortho-functionalized substrates, we are currently also using *γ-functionalized allylboronates*, unprecedented in enantioselective catalysis (Scheme 3).[3] The α-silylhomoallylic alcohols obtained were further transformed into fluorinated allylic alcohols (Scheme 3).

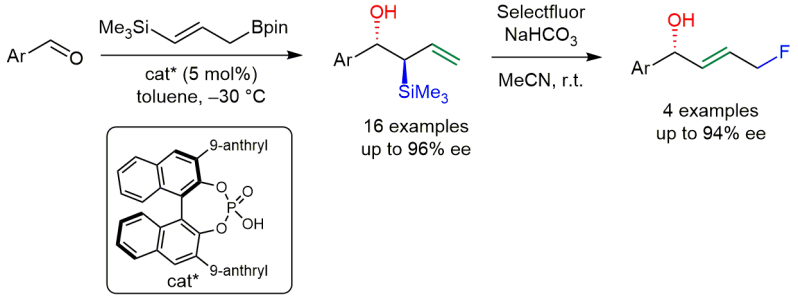
Last but not least, the third project deals with medicinal chemistry. In collaboration with Professor Gallego from the Universidad Católica de Valencia, bilaterally substituted terphenyl derivatives were found as effective inhibitors of the replication cycle of the HIV-1 virus. Currently, we are designing and synthesizing a second generation of anti-HIV agents and we also want to extend the applicability of such compounds in order to tackle a second-world pandemic, malaria.

**SYNFORM** *When did you get interested in synthesis?*

**Prof. P. Barrio** I have been interested in science since I was very young. However, the decision to study chemistry was made at the very last moment before I started at university… physics and mathematics were serious options but finally chemistry, being a science much less abstract than physics or mathematics (we do 'touch' our matter of study!), tipped the scales. During my second year as an undergraduate student I met Professor Barluenga who taught me the first organic chemistry course I ever took. I believe that his passion for synthesis played a decisive role in my interest for organic synthesis.

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

**Prof. P. Barrio** Undoubtedly, sustainability must be one of the major foci in modern synthesis. We have shown that we are able to synthesize very complex molecules in very high levels of selectivity (chemo-, regio-, stereo-), sometimes even mimicking nature's own levels of selectivity. The next challenge is making these beautiful transformations in ways that are as respectful to the environment as possible. Of course, we also must keep asking ourselves questions and coming up with creative solutions for new synthetic challenges. Another




**Scheme 3** γ-Silylallylboronates in the chiral Brønsted acid catalyzed allylboration of aldehydes

important aspect of modern organic synthesis is interdisciplinarity. We must be able to understand our colleagues in other branches of science and make our solutions understandable to them.

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

**Prof. P. Barrio** In the first question, I explained the topic of our research in detail; here, I would like to focus a little more on the aims. I won't make high-sounding statements; my motivations are quite humble, if I may say so. First of all, I try to learn. Second, I try to come up with useful synthetic methods… chemistry that is reliable and applicable for the preparation of potentially widely used building blocks, with a special focus on drug discovery. Finally, teaching chemistry to students. I believe that in an academic laboratory this is enough of an aim. Even if this was the only usefulness of our research it would be a very important one. Our research is the means we use to train new chemists. The more they learn from our research, the better chemists they will become. This is a good reason to seek challenging research topics and carry them out in a proficient manner…that the next generation produces better chemists than us.

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

**Prof. P. Barrio** The part of my work I feel most proud of is everything related to the chiral Brønsted acid catalyzed allylations. This is a research project that I set up within the research group of Professor Fustero. In a couple of years we have made a few interesting contributions to this competitive field that have had high impact. Related to the previous question, I also feel very proud of having mentored a number of students and witnessed how they have turned into mature chemists.

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