



Figure 1. The skyscape of rising, steady and setting stars in some representative institutions of national importance. The IITs at Indore and Patna are clearly investing in a replacement generation.

its rising stars (as seen for IISc), or whether it is doing enough to ensure its robust future (as is the case here with the IITs at Indore and Patna).

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Acknowledging the influence of Carlos F. Barbas III's work on organocatalysis

The News item by Santanu Mukherjee¹ provided glimpses of two organic chemists, Benjamin List and David W. C. MacMillan, who shared the 2021 Nobel Prize in Chemistry, much to the delight of organic chemistry enthusiasts. As the note reminisced on their contributions to the origins and development of organocatalysis, it would be apt to remember and acknowledge the pioneering contributions of Carlos F. Barbas III (1964–2014, Scripps Research Institute, USA), whose work on biomimetic catalysis also influenced the birth of this field.

Barbas was among the first scientists to initiate research that combined organic chemistry with structural biology and medicine. An important outcome of this was his ideation of the catalysis of organic reactions by antibodies, in a metals-free approach. Stereoselective aldol transformations were catalysed by catalytic antibodies without need for modification of the interacting ketones – for example, into preformed enolates. His body of work on such catalytic antibodies was placed under 'biomimetic catalysis'.

List was a postdoctoral student of Barbas in 1999, and his first report on asymmetric catalysis of the aldol reaction between acetone and *para*-nitro benzaldehyde was co-authored by Barbas. Incidentally, Richard A. Lerner was the postdoctoral advisor of Barbas. Later, Barbas conducted comparative studies between proline catalysis and aldolase antibodies-catalysis of the Hajos–Eder–Sauer–Wiechert (aldol cyclodehydration) reaction. This work fuelled the excitement in establishing proline as an efficient 'active-site equivalent' – later termed as 'an organocatalyst'. These studies and parts of his earlier comparative mechanistic studies with aldolase antibodies were crucial in establishing the enamine pathway of proline catalysis³.

The field of organocatalysis received the right impetus from Barbas's initial findings that aldolase antibodies were better catalysts than proline. His group was also among the first to systematically establish the superior catalytic efficiency of proline over non-proline amino acids. He notably also initiated studies in RNA and DNA catalysis – a follow-up of which has led to

sophisticated nucleic acid catalysts. As we honour and cherish the contributions of the two 2021 Nobel Laureates in Chemistry, it is both apt and essential to remember with gratitude, the influence of Barbas's work on the origins of organocatalysis. He unfortunately passed away in 2014, succumbing to a rare form of medullary thyroid cancer. The Nobel Prize is not presented posthumously. If he had been alive, Barbas might well have been considered as a joint recipient of this Prize.

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