



## PROFILE

Our research group aspires to contribute to the Society by enabling *protein-based directed therapeutics* and making *covalent inhibitor precision therapeutics* possible in the future. In this perspective, we are spearheading chemical technologies for the *precision engineering of proteins*. Subsequently, they empower homogeneous antibody conjugates (ADCs and AFCs) for directed cancer chemotherapeutics and image-guided tumor surgery.

Our technologies led to the foundation of Plabeltech Private Limited. The state-of-the-art proprietary platforms, LDM®, Gly-Tag®, and Maspecter®, empowers Plabeltech.

## CONTACT

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## ADDRESS

Department of Chemistry  
IISER Bhopal, Bhopal Bypass Road  
Bhauri, Bhopal 462 066 MP  
INDIA

# VISHAL RAI

Professor, Head, & Swarnajayanti Fellow, IISER Bhopal

## ACADEMIC QUALIFICATION

### Ph.D.

2003 – 2008, IIT Bombay; CSIR Fellow  
Coursework SPI 9.23/10 (Supervisor: Prof. I. N. N. Namboothiri)

### M.Sc.

2001 – 2003, BHU; Chemistry, Major: Organic Chemistry (Marks 74.4%)

### B.Sc.

1998 – 2001, BHU; Physics, Chemistry (H), Mathematics (Marks 70.3%)

## WORK EXPERIENCE

### Professor, Department of Chemistry, IISER Bhopal

2022-Till date (Swarnajayanti Fellowship: 2020-2025)

### Assistant & Associate Professor, Dept. of Chemistry, IISER Bhopal

2011–2017; 2017-2022 (Ramanujan Fellowship: 2011-2016)

### Postdoctoral and MITACS Elevate Fellow, University of Toronto

2008–2011 (Mentor: Prof. Andrei Yudin)

## SELECTED PROFESSIONAL RECOGNITION

RVP: VY - Shanti Swarup Bhatnagar, 2024

Distinguished Teachers Award, 2023 & 2024

Chemical Science, RSC, UK, Advisory board member, 2023

Asia Representative, CCECNC, Commonwealth Chemistry, 2023

CRSI Bronze Medal, 2022

SERB-PACE: Precision Antibodies Engineering Center, 2022

CDRI Award for Excellence in Drug Research, 2021

SERB-TETRA Technology Translation Award, 2021

Swarnajayanti Fellowship, DST and SERB, India, 2020

Invited FRSC, Leaders in the Field Scheme, UK, 2020

ACS Chemical Biology, ECB Member, 2020

DAE Young Scientist Award, 2012

Ramanujan Fellowship, DST, India 2011

**1. Name and full correspondence address**

Prof. Vishal Rai

Department of Chemistry, Indian Institute of Science Education and Research Bhopal, Bhopal Bypass Road, Bhauri, Bhopal 462 066 Madhya Pradesh, India

**2. Email(s) and contact number(s)**

E-mail ID: [vrai@iiserb.ac.in](mailto:vrai@iiserb.ac.in)

Phone: +91-755-2691339, +91-7566189001

**3. Institution**

Indian Institute of Science Education and Research Bhopal

**4. Date of Birth**

28-06-1979

**5. Gender**

Male

**6. Category**

General

**7. Whether differently abled?**

No

**8. Academic Qualification (Undergraduate Onwards)**

S. No.	Degree	Year	Subject	University	% Marks
1	M.Sc.	2003	Chemistry (Major: Organic Chemistry)	BHU	74.4
2	B.Sc.	2001	Physics, Mathematics, Chemistry (Honors)	BHU	70.3

**9. Ph.D. thesis title, Guide's Name, Institute/Organization/University, Year of Award**

**Ph.D. thesis title:** "Mechanistic, Stereochemical and Synthetic Investigations on the Conjugate Addition to Nitroalkenes". Course work (SPI 9.23/10)

**Guide's name:** Prof. I. N. N. Namboothiri

**Institute:** Indian Institute of Technology Bombay

**Year of Award:** 2008

**10. Work experience (in chronological order)**

S. No.	Positions held	Name of Institute	From	To	Pay Scale
1	Professor and <i>Swarnajayanti Fellow (2020)</i>	IISER Bhopal	2022	Till date	14A
2	Associate Professor	IISER Bhopal	2017	2022	13A2
3	Assistant Professor and <i>Ramanujan Fellow (2011)</i>	IISER Bhopal	2011	2017	37400-67000-PB-4-AGP-9000
4	MITACS Elevate Postdoctoral Fellow	University of Toronto	2011	2011	45,000 CAD/year
5	Postdoctoral Fellow	University of Toronto	2008	2011	36,000 CAD/year

### 11. Professional Recognition

S. No.	Recognition / Award	Awarding Agency	Year
28	Rashtriya Vigyan Puraskar: VY - Shanti Swarup Bhatnagar	Govt. of India	2024
27	Distinguished Teachers Award	IISER Bhopal	2024
26	CRS-RP & Industry Translation Award	CRS, India	2024
25	Research Partnerships & Industry Translation Award	CRS, India	2024
24	G. D. Gokhale Lectureship Fellow	ICT Mumbai	2024
23	Advisory board member, Chemical Science	RSC, UK	2023
22	Pioneering Investigator – Chemical Society Reviews	RSC, UK	2023
21	Distinguished Teachers Award	IISER Bhopal	2023
20	Nominated by CRSI to represent India at 2 <sup>nd</sup> Commonwealth Chemistry Congress	CRSI	2023
19	Asia representative, Commonwealth Chemistry Early Career Network Committee (CCECNC)	Commonwealth Chemistry	2023
18	Leading Investigator in India	AsiaChem	2023
17	Editor-in-Chief search committee for ACS publications	ACS, USA	2022
16	Council Member, National Organic Symposium Trust	NOST, India	2022
15	CRSI Bronze Medal	CRSI, India	2022
14	SERB-IRHPA: Precision Antibodies Engineering Center (PACE)	SERB, India	2022
13	CDRI Award for Excellence in Drug Research	CSIR-CDRI, India	2021
12	SERB-TETRA Technology Translation Award	SERB, India	2021
11	National Co-Chair, International Chemical Biology Society	ICBS	2021
10	Invited Fellow of Royal Society of Chemistry (FRSC; Leaders in the Field Scheme)	RSC, UK	2020
9	Early Career Board Member, ACS Chemical Biology	ACS, USA	2020
8	Swarnajayanti Fellowship	DST, India	2020
7	International Travel Award	SERB, India	2017
6	DAE Young Scientist Award	DAE-BRNS, India	2012
5	Young Scientist Award	RSC-WIS, India	2012
4	Ramanujan Fellowship	SERB, India	2011
3	MITACS Elevate Postdoctoral Fellowship	MITACS, Canada	2011
2	Senior Research Fellowship	CSIR, India	2005
1	Junior Research Fellowship	CSIR, India	2003

### 12. Publications

S. No.	Author(s)	Title	Name of Journal	Volume	Page	Year
<b>From IISER Bhopal</b>						
40	Rawale, D. G.; Gupta, M.; Thakur, K.; Ragendu, V.; <b>Rai, V.</b>	Ordered immobilization of serine proteases enabled by linchpin directed modification platform	<i>Chem. Commun.</i>	60	7168-7171	2024
39	Chauhan, P.; Ragendu, V.; Kumar, M.; Molla, R.;	Chemical technology principles for selective bioconjugation of	<i>Chem. Soc. Rev.</i>	53 (Themed collection: 2023	380-449	2024

	Mishra, S. D.; Basa, S.; <b>Rai, V.</b>	proteins and antibodies		Pioneering Investigators)		
38	Bauri, R.; Bele, S.; Edelli, J.; Reddy, N. C.; Kurukuti, S.; Devasia, T.; Ibrahim, A.; <b>Rai, V.</b> ; Mitra, P.	Reduced Incretin Receptor Trafficking upon Activation Enhances Glycemic Control and Reverses Obesity in Diet-Induced Obese Mice	<i>Am. J. Physiol. – Cell Physiol.</i>	327	C74-C96	2024
37	Molla, R.; Joshi, P. N.; Reddy, N. C.; Biswas, D.; <b>Rai, V.</b>	Protein-protein interaction in multicomponent reaction enables chemoselective, site-selective, and modular labeling of native proteins	<i>Org. Lett.</i>	25 (Invited contribution to special issue)	6385-6390	2023
36	Chauhan, P.; Ragendu, V.; Kumar, M.; Molla, R.; Unnikrishnan, V. B., <b>Rai, V.</b>	<b>Disintegrate (DIN)</b> theory enabling precision engineering of proteins	<i>ACS Cent. Sci.</i>	9 (Invited contribution for core principles of the field)	137 - 150	2023
35	Ragendu, V.; Kumar, M.; Molla, R.; Thakur, K.; Chauhan, P.; Rai, V.	Evolution of chemistry for precision engineering of proteins	<i>AsiaChem</i>	3 (Invited contribution: chemistry in India)	124-135	2023
34	Reddy, N. C.; Molla, R.; Joshi, P. N.; Sajeev, T. K.; Basu, I.; Kawadkar, J.; Kalra, N.; Mishra, R. K.; Chakrabarty, S.; Shukla, S.; <b>Rai, V.</b>	Traceless cysteine-linchpin enables precision engineering of lysine in native proteins	<i>Nat. Commun.</i>	13 ( <b>LDM<sup>®</sup></b> technology)	6038	2022
33	Thakur, K.; Sajeev, T. K.; Singh, S. K.; Ragendu, V.; Rawale, D. G.; Adusumalli, S. R.; Kalra, N.; Shukla, S.; Mishra, R. K.; <b>Rai, V.</b>	Human behavior inspired linchpin directed catalysis for traceless precision labeling of native proteins	<i>Bioconjugate Chem.</i>	33 ( <b>LDC</b> technology)	2370	2022
32	Sahu, T.; Kumar, M.; Sajeev, T. K.; Joshi, M.; Mishra, R. K.; <b>Rai, V.</b>	Residue-specific N-terminal glycine to aldehyde transformation renders analytically pure single-site labeled proteins	<i>Chem. Commun.</i>	58 ( <b>Gly-Tag<sup>®</sup></b> technology)	12451 - 12454	2022

31	Sahu, T.; Chilamari, M.; <b>Rai, V.</b>	Protein inspired chemically orthogonal imines for linchpin directed precise and modular labeling of lysine in proteins	<i>Chem. Commun.</i>	58 ( <b>LDM</b> <sup>®</sup> technology)	1768-1771	2022
30	Bal, A.; Singh, S. K.; Kashyap, T.; <b>Rai, V.</b>	Linchpin-directed precise labeling of lysine in native proteins, purification, and analysis	<i>Meth. Enzymol.</i>	675 ( <b>LDM</b> <sup>®</sup> technology)	383-396	2022
29	Rawale, D. G.; Thakur, K.; Pranav, S.; Sajeev, T. K.; Ramesh, A.; Adusumalli, S. R.; Mishra, R. K.; <b>Rai, V.</b>	Linchpin empowers promiscuous electrophile to render site-selective modification of histidine and aspartic acid in proteins	<i>Chem. Sci.</i>	12 ( <b>LDM</b> <sup>®</sup> technology)	6732-6736	2021
28	Kumar, M.; Reddy, N. C.; <b>Rai, V.</b>	Chemical technologies for precise protein bioconjugation enabling biology and medicine	<i>Chem. Commun.</i>	57 (Feature article)	7083-7095	2021
27	Ramesh, A.; Thakur, K.; <b>Rai, V.</b>	Reactivity and selectivity principles in native protein bioconjugation	<i>Chem. Rec.</i>	21	1941-1956	2021
26	Purushottam, L.; Unnikrishnan, V. B.; Rawale, D. G.; Gujrati, M.; Mishra, S. D.; Sajeev, T. K.; Reddy, N. C.; Adusumalli, S. R.; Mishra, R. K.; <b>Rai, V.</b>	Single amino acid Gly-tag enables metal free protein purification	<i>Chem. Sci.</i>	11 ( <b>Gly-Tag</b> <sup>®</sup> technology) (Part of "Most Popular Chemical Biology Articles")	13137 - 13142	2020
25	Adusumalli, S. R.; Rawale, D. G.; Thakur, K.; Purushottam, L.; Reddy, N. C.; Kalra, N.; Shukla, S.; <b>Rai, V.</b>	Chemoselective and site-selective lysine-directed lysine modification enables single-site labeling of native proteins	<i>Angew. Chem. Int. Ed.</i>	59 ( <b>LDM</b> <sup>®</sup> technology)	10332 - 10336	2020
24	Reddy, N. C.; Kumar, M.; Molla, R.; <b>Rai, V.</b>	Chemical methods for modification of proteins	<i>Org. Biomol. Chem.</i>	18 ( <b>Invited review</b> , special issue on, "Methodology Development for Protein	4669-4691	2020

				Modifications")		
23	Purushottam, L.; Adusumalli, S. R.; Singh, U.; Unnikrishnan, V. B.; Rawale, D. G.; Gujrati, M.; Mishra, R. K.; <b>Rai, V.</b>	Single-site glycine-specific labeling of proteins	<i>Nat. Commun.</i>	10 ( <b>Featured in Editors' Highlights</b> )  ( <b>Gly-Tag<sup>®</sup></b> technology)	2539	2019
22	Gupta, N.; Ansari, A.; Dhoke, G. V.; Chilamari, M.; Sivaccumar, J.; Kumari, S.; Chatterjee, S.; Goyal, R.; Mukherjee, M.; Sarkar, A.; Mandal, S. K.; <b>Rai, V.</b> ; Biswas, G.; Sengupta, A.; Roy, M.; Roy, S.; Sengupta, S.	Computationally designed antibody-drug conjugates self-assembled via affinity ligands	<i>Nat. Biomed. Eng.</i>	3 ( <b>Highlighted in Nature BME News and Views</b> )	917-929	2019
21	Rawale, D. G.; Thakur, K.; Adusumalli, S. R.; <b>Rai, V.</b>	Chemical methods for selective labeling of proteins	<i>Eur. J. Org. Chem.</i>	- ( <b>Invited minireview</b> )	6749-6763	2019
20	Singudas, R.; Reddy, N. C.; <b>Rai, V.</b>	Sensitivity booster for mass detection enables unambiguous analysis of peptides, proteins, antibodies, and protein conjugates	<i>Chem. Commun.</i>	55 ( <b>Maspecter<sup>®</sup></b> technology)	9979-9982	2019
19	Joshi, P. N.; <b>Rai, V.</b>	Single-site labelling of histidine in proteins, on-demand reversibility, and traceless metal-free protein purification	<i>Chem. Commun.</i>	55 ( <b>Highlighted in F1000</b> )	1100-1103	2019
18	Adusumalli, S. R.; Rawale, D. G.; Singh, U.; Tripathi, P.; Paul, R.; Kalra, N.; Mishra, R. K.; Shukla, S.; <b>Rai, V.</b>	Single-site labelling of native proteins enabled by a chemoselective and site-selective chemical technology	<i>J. Am. Chem. Soc.</i>  ( <b>LDM<sup>®</sup></b> technology)	140 ( <b>Highlighted in F1000</b> )	15114 - 15123	2018
17	Adusumalli, S. R.; Rawale, D. G.; <b>Rai, V.</b>	Aldehyde can switch chemoselectivity of electrophiles in the protein labelling	<i>Org. Biomol. Chem.</i>	16	9377-9381	2018
16	Chilamari, M.; Kalra, N.; Shukla, S.; <b>Rai, V.</b>	Single-site labeling of lysine in proteins	<i>Chem. Commun.</i>	54	7302-7305	2018

		through a metal-free multicomponent approach				
15	Chilamari, M.; Purushottam, L.; <b>Rai, V.</b>	Site-selective labeling of native proteins by a multicomponent approach	<i>Chem. Eur. J.</i>	23	3819-3823	2017
14	Purushottam, L.; Adusumalli, S. R.; Chilamari, M.; <b>Rai, V.</b>	Chemoselective and site-selective peptide and native protein modification enabled by aldehyde auto-oxidation	<i>Chem. Commun.</i>	53	959-962	2017
13	Joshi, P. N.; Purushottam, L.; Das, N. K.; Mukherjee, S.; <b>Rai, V.</b>	Protein self-assembly induces promiscuous nucleophilic biocatalysis in Morita-Baylis-Hillman (MBH) reaction	<i>RSC Advances</i>	6	208-211	2016
12	Singudas, R.; Adusumalli, S. R.; Joshi, P. N.; <b>Rai, V.</b>	A phthalimide protocol that follows protein defined parameters	<i>Chem. Commun.</i>	51 <b>(Featured on back cover)</b>	473-476	2015
11	Rotstein, B. R.; Zaretsky, S.; <b>Rai, V.</b> ; Yudin, A. K.	Small heterocycles in multicomponent reactions	<i>Chem. Rev.</i>	114	8323-8359	2014
10	Chilamari, M.; <b>Rai, V.</b>	Organometallic complexes: catalysis and application in protein modification	<i>Indian J. Chem., Sec. A</i>	52A <b>(Invited contribution)</b>	992-1003.	2013
<b>From University of Toronto</b>						
9	Zaretsky, S.; <b>Rai, V.</b> ; Gish, G.; Forbes, M. W.; Kofler, M.; Yu, J. C. Y.; Tan, J.; Hickey, J. L.; Pawson, T.; Yudin, A. K.	Twisted amide electrophiles enable cyclic peptide sequencing	<i>Org. Biomol. Chem.</i>	13	7384-7388	2015
8	Scully, C. C. G.; <b>Rai, V.</b> ; Zaretsky, S.; Burns, D. C.; Houlston, R. S.; Lou, T.; Yudin, A. K.	Bending rigid molecular rods: formation of oligoproline macrocycles	<i>Chem. Eur. J.</i>	18	15612 - 15617	2012
7	Rotstein, B. H.; <b>Rai, V.</b> ; Hili, R.; Yudin, A. K.	Synthesis of peptide macrocycles using unprotected amino aldehydes	<i>Nat. Protoc.</i>	5	1813-1822	2010
6	Jebrail, M. J.; Ng., A. H. C.; <b>Rai, V.</b> ; Hili, R.; Yudin, A. K.	Synchronized synthesis of peptide-based macrocycles by digital	<i>Angew. Chem. Int. Ed.</i>	49 <b>(Featured on inside cover)</b>	8625-8629	2010

	Wheeler, A. R.	microfluidics				
5	Hili, R, <b>Rai, V.</b> ; Yudin, A. K.	Macrocyclization of linear peptides enabled by amphoteric molecules	<i>J. Am. Chem. Soc.</i>	132 ( <b>Highlighted in Science, C&amp;EN and F1000</b> )	2889-2891	2010
<b>From IIT Bombay</b>						
4	<b>Rai, V.</b> ; Namboothiri, I. N. N.	Enantioselective conjugate addition of dialkylphosphites to nitroalkenes	<i>Tetrahedron: Asymmetry</i>	19	2335-2338	2008
3	<b>Rai, V.</b> ; Namboothiri, I. N. N.	Effect of achiral and mixed chiral ligands in the synthesis of $\gamma$ -nitrophosphonates via Michael addition	<i>Tetrahedron: Asymmetry</i>	19	767-772	2008
2	<b>Rai, V.</b> ; Mobin, S. M.; Namboothiri, I. N. N.	Cinchonine catalyzed diastereo- and enantioselective Michael addition of $\alpha$ -lithiated phosphonates to nitroalkenes	<i>Tetrahedron: Asymmetry</i>	18	2719-2726	2007
1	<b>Rai, V.</b> ; Namboothiri, I. N. N.	A theoretical evaluation of the Michael-acceptor ability of conjugated nitroalkenes	<i>Eur. J. Org. Chem.</i>	-	4693-4703	2006

### 13. Detail of patents

S. No.	Patent Title	Name of Applicant(s)	Patent No.	Award Date	Agency/ Country
<b>From IISER Bhopal*</b>					
10	Multi-equilibria system enables precise carboxylic acid engineering in proteins	<b>Rai, V.</b> ; Molla, R.; Biswas, D.; Singudas, R.	202421042107	May 30, <b>2024</b>	Provisional patent filed
9	Linchpin directed catalysis for traceless site-selective labeling of native proteins	<b>Rai, V.</b> ; Thakur, K.	202221062576	Nov 2, <b>2022</b>	Provisional patent filed
8	Chemoselective sensitivity booster and the process thereof	Singudas, R.; Reddy, N. C.; <b>Rai, V.</b>	201921022294	June 5, <b>2019</b>	Indian and International (Filed) <i>Licensed to Plabeltech</i>
7	N-terminus Gly-tag specific modification, capture, and release of protein enabling metal-	<b>Rai, V.</b>	201921015806	April 22, <b>2019</b>	Indian and International (Filed) <i>Licensed to</i>



	free protein purification				<i>Plabeltech</i>
6	Hemiaminal-tag for protein labeling and purification	<b>Rai, V.;</b> Purushottam, L.	201621041808, Dec 7, <b>2016</b> ; PCT/IN2017/050570, Dec 5, <b>2017</b> ; WO-2018104962-A1, June 14, <b>2018</b> .	Dec 7, <b>2016</b>	Indian and International (Filed) <i>Licensed to Plabeltech</i>
5	Site-selective protein labelling and synthesis of homogeneous protein conjugates	<b>Rai, V.;</b> Chilamari, M.; Purushottam, L.	201621030484, Sept 7, <b>2016</b> ; PCT/IN2017/050362, Aug 29, <b>2017</b> ; WO-2018047197-A1, Mar 15, <b>2018</b> .	Sept 7, <b>2016</b>	Indian and International (Granted) <i>Licensed to Plabeltech</i>
4	Multi-functional Chemical Agents for Protein Modification	<b>Rai, V.,</b> Adusumalli, S. R.	201611009537, Nov 15, <b>2016</b> ; PCT/IN2016/050408, Nov 17, <b>2016</b> ; WO2017158612-A1, Sept 21, <b>2017</b> .	Mar 18, <b>2016</b>	Indian and International (Granted) <i>Licensed to Plabeltech</i>
<p><b>*Additional:</b> <a href="http://www.plabeltech.com">Our technologies led to the foundation of Plabeltech Private Limited (www.plabeltech.com)</a></p> <p><b>Recognitions/funds:</b> National Start-up Award 2021, TDB, DST India; BIRAC-BIG grant 2017</p> <p><b>Licensed patents:</b> FIVE; <b>Registered trademarks:</b> THREE (LDM<sup>®</sup>, Gly-Tag<sup>®</sup>, Maspecter<sup>®</sup>)</p> <p><b>Products:</b> FOUR (Biotechnology sector); <b>Services:</b> Precision protein engineering, antibody-conjugates</p>					
<b>From University of Toronto**</b>					
3	Boronic Acid Catalyzed Macrocyclization of Linear Peptides	<b>Rai, V.;</b> Yudin, A. K.	RIS 10002115	Aug 10, <b>2010</b>	International (Granted)
2	A Method to Insert Molecular Fragments into Cyclic Molecules	<b>Rai, V.;</b> Hili, R.; Yudin, A. K.	RIS 10002116	Aug 10, <b>2010</b>	International (Granted)
<b>**Additional information: our technologies led to the foundation of Encycle Therapeutics</b>					
<b>From IIT Bombay</b>					
1	Asymmetric Synthesis of $\gamma$ -Nitrophosphonates in the Absence of any Other Chiral Catalyst	<b>Rai, V.;</b> Namboothiri, I. N. N.	2359/MUM/2007	Nov 30, <b>2007</b> .	National (Granted)

#### 14. Books/Reports/Chapters/General articles etc.

S.No.	Title	Author's name	Publisher (Details)	Year
2	Book chapter: "Cyclic Peptides", pp 321-369, in " <i>Natural Lactones and Lactams. Synthesis, Occurrence and Biological Activity</i> ".	Adusumalli, S. R.; Yudin, A. K.; <b>Rai, V.</b>	Wiley-VCH Ed. Janecki, T.	2013
1	Conference proceedings: Synchronized Synthesis of Cyclic Peptides by Digital Microfluidics, Jebrail, 1297-1299.	M.J.; Ng, A.; <b>Rai, V.;</b> Hili, R.; Yudin, A. K; Wheeler, A. R.	<i>Proc. Micro. Tot. Anal. Sys.</i> , Chemical and Biological Microsystems Society, San Diego, CA,	2009

## 15. Any other Information

### On-going projects

Project Title	Funding agency	Total Cost (INR)	Period
SERB-IRHPA Precision Antibodies Engineering Center ( <b>SERB-PACE</b> : IISER Bhopal, NCCS Pune, KGMU Lucknow)	SERB	12,00,04,245	10/03/22 to 09/03/27
Disintegrate (DIN) theory driven principles to accelerate precision engineering of proteins (CRG)	SERB	68,46,400	16/03/2024 to 15/03/2027
Chemical toolbox for precision engineering of proteins ( <b>Swarnajayanti Fellowship</b> , contingency, and research grant)	DST/SERB	40,00,000 and 3,16,49,280	1/2/20 to 31/1/25 and 2/3/20 to 1/3/25

### Past projects

Multi-functional chemical agents, and the method for protein modification ( <b>SERB Technology Translation Award</b> )	SERB	30,10,000	24/03/2021 to 23/03/2023
Gly-tag for precision labeling of proteins ( <b>Core Research Grant; Graded excellent</b> )	SERB	55,25,850	1/7/2019 to 30/6/2022
Chemoselectivity regulation of functional groups in the chemical labelling of proteins ( <b>OC Special Drive; Graded excellent</b> )	SERB	66,72,000	27/7/2018 to 26/7/2021
Chemical methodologies directed towards synthesis of antibody-drug conjugates ( <b>EMR; Graded excellent</b> )	SERB	32,74,000	1/8/2015 to 31/7/2018
Chemical methodology hinged on peptide-protein interaction for site-selective protein labeling ( <b>Rapid Grant for Young Investigators</b> )	DBT	19,45,000	1/12/2013 to 30/11/2016
Entropy regulation of amino acid oligomers: New modes of catalysis ( <b>Young Scientist Award</b> )	DAE	13,00,000	1/8/2012 to 31/7/2015
Conformationally constrained peptide based ligands in organocatalytic transformations ( <b>Fast Track Scheme for Young Scientists</b> )	SERB	27,00,000	1/08/2012 to 31/7/2015
Peptide based catalyst for asymmetric synthesis ( <b>Ramanujan Fellowship</b> )	SERB	73,00,000	1/7/2011 to 30/6/2016

### Translation of our technological platforms

Our group contributed two trademark technological platforms: **LDM<sup>®</sup>** and **Gly-Tag<sup>®</sup>**. Two technologies from our proprietary **LDM<sup>®</sup>** platform reached the TRL9 level and is being used commercially for the precision engineering of proteins, enzymes, and antibodies. One product (TRL9) derived from the **Gly-**

**Tag**<sup>®</sup> platform is commercialized, whereas one more is in the pipeline (TRL6). Our **Maspecter**<sup>®</sup> technology rendered three commercially available products (TRL9).

***Disruptive technology driven start-up company:***

Our innovations for precision engineering of proteins led to the foundation of Plabeltech Private Limited in 2018. The initial grant-in-aid of INR 49.5 lakhs was generated through BIRAC-BIG. Plabeltech was awarded National Startup Award 2021 from Technology Development Board, DST, Government of India. The products and services of the company started generating revenues in FY 2019-2020 (For details, see: [www.plabeltech.com](http://www.plabeltech.com)).

***Invited Lectures***

[93] Invited talk on “Organic chemistry with proteins: technological demand and solutions,” Govt. Madhav College, Ujjain, Aug 27-28, **2024**.

[92] Invited talk on “Proteins: a new landscape for organic chemistry,” Vidharthri Academy, Bengaluru, Aug 26, **2024**.

[91] Invited talk on “Chemical technologies for precision engineering of proteins,” in Science Beyond Boundary: Invention, Discovery, Innovation, and Society - Rasayan 19” IISER, Kolkata, July 29-30, **2024**.

[90] IIT Indore Chemistry Outreach Lecture on “Engineering bonds: from human behavior to molecules,” IIT Indore, April 10, **2024**.

[89] Invited talk on “Chemical technologies for precision engineering of proteins and antibodies,” at NIICT-2024, CSIR-IICT Hyderabad, March 7-9, **2024**.

[88] Invited talk on “DisIntegrate for precision engineering of proteins and antibodies,” at the International Conference On Sustainable Chemistry II, Kenilworth Resort, Goa, February 20-22, **2024**.

[87] Workshop on “Organic chemistry with proteins: basics, technologies, and translation,” Refresher course on Sustainability and Interdisciplinarity in Chemistry, UGC- Malaviya Mission Teacher Training Centre Jadavpur University, Thursday, February 15, **2024**.

[86] Invited talk on “Chemical technologies for precision engineering of proteins and antibodies,” Symposium on Synthesis, Catalysis, and Chemical Biology, ICT Mumbai, January 18-19, **2024**.

[85] Outreach talk on “Chemical technologies for precision engineering of proteins and antibodies,” Genvision-BIOS-2024, Department of Biosciences and Bioengineering, January 13-14, **2024**.

[84] Invited talk on “Disintegrate theory for precision engineering of proteins and antibodies,” IUPAC-IsBOC-13, NTU Singapore, December 18-20, **2023**.

[83] Invited talk on “Disintegrate theory for precision engineering of proteins and antibodies,” Indo-German Workshop, University of Würzburg, Germany, October 11-13, **2023**.

[82] Invited talk on “Disintegrate theory for precision engineering of proteins and antibodies,” UK-India Symposium on Chemical Sciences, University of Bristol, UK, September 14, **2023**.

[81] Invited talk on “Chemical technologies for precision engineering of proteins and antibodies,” International Conference on Science and Technology for Innovative and Sustainable Development, Mizoram University, Aizawl, June 28-30, **2023**.

[80] Invited Department talk on “Chemical technologies for precision engineering of proteins and antibodies,” Chemical Biology Program, Memorial Sloan Kettering Cancer Center, New York, USA, May 23-25, **2023**.

[79] Invited talk on “Chemical technologies for precision engineering of proteins and antibodies,” Commonwealth Chemistry Congress, Trinidad and Tobago, University of West Indies, May 23-25, **2023**.

[78] Outreach talk on “Graduation of organic chemistry for precision engineering of proteins,” Allotropes of Chemistry, ChemClub, IISER Bhopal, March 23, **2023**.

[77] Invited talk on “Chemical technologies for precision engineering of proteins and antibodies,” Interactions with team Syngene, Syngene Int. Ltd., Biocon SEZ, Biocon Park, Bangalore, Jan 25, **2023**.

- [76] Invited talk on "Disintegrate theory enabling precision engineering of proteins," Chemical Science 2023 Leaders in the Field Symposium, JNCASR Bangalore, January 22-25, **2023**.
- [75] Invited talk on "Chemical technologies for precision engineering of proteins and antibodies," Interactions with team Aurigene, Aurigene Oncology, Bangalore, Jan 25, **2023**.
- [74] Invited talk on "Traceless cysteine-linchpin enables precision engineering of lysine in native proteins," Science society on Clubhouse, Host: Dr. Catarina Cunha, Dept. of Neuroscience, New York University. January 17, **2023**.
- [73] Invited talk on "Chemical technologies for precision engineering of proteins and antibodies," SERB-DFG Indo-German conclave on a week for young researchers, November 7-10, **2022**.
- [72] Invited talk on "Chemical technologies for precision engineering of proteins and antibodies," 14th Annual meeting of the Proteomics Society, India and International conference on proteins and proteomics, November 3-5, **2022**.
- [71] Invited talk on "Human nature inspires precision engineering of proteins," Asian Chemical Biology Initiative (ACBI), Zuri White Sands, Goa, India, September 15-18, **2022**.
- [70] Invited talk on "Platforms for precisely engineered protein and antibody conjugates," 1st Industry-Academia NOST Conclave, EMBA Hall, SOM, IIT Bombay, September 13-14, **2022**.
- [69] Future oriented research conferences and exhibitions (FORCE) - Interdisciplinary initiatives in chemical sciences (IICS), Jaypee Palace, Agra, July 28-31, **2022**.
- [68] Workshop on "Application of NMR spectroscopy to scientific research" at IISER Bhopal, July 10-16, **2022**.
- [67] CRSI Bronze Medal Talk, 29th CRSI-NCS and CRSI-ACS Symposium, IISER Mohali, July 7-9, **2022**.
- [66] Medical Science and Engineering Research Center (MEDSER) Workshop, IISER Bhopal, July 1-2, **2022**.
- [65] Department talk, Department of Chemistry, Rutgers University, USA, June 23, **2022**.
- [64] Department talk, Institute for Quantitative Biomedicine, Department of Chemistry and Chemical Biology, Emory University, USA, June 20, **2022**.
- [63] Gordon Research Conference (GRC), Bioorganic Chemistry, Proctor Academy, NH, USA, June 12-17, **2022**.
- [62] University of Jammu, Azadi ka Amrit Mahotsav, DST and University of Jammu, Feb 27, **2022**.
- [61] RTCS-OBC-2021, 58th Annual Convention of Chemists (ACC), Indian Chemical Society (ICS), IIT Kharagpur and IISER Kolkata, Dec 22-24, **2021**.
- [60] Webinar on "Biologics and Novel Therapeutic Modalities." Talk: LDM platform for precision engineering of antibody-drug conjugates. Chemistry Europe: ChemBioChem & ChemMedChem, Dec 13, **2021**.
- [59] Important Aspects of Organic Chemistry for Sustainable Industrial Development, Department of Chemistry, IIT Patna, October 30, **2021**.
- [58] Emerging Trends in Medicinal Chemistry, Department of Medicinal Chemistry, NIPER Guwahati, October 29, **2021**.
- [57] CSIR-CDRI Award 2021 Talk on "Precision engineering of proteins enabling biology and medicine." CDRI Lucknow, September 27, **2021**.
- [56] Webinar on "Harnessing the potential of protein engineering to combat diseases." Talk: Protein engineering and directed therapeutics. Tata Institute for Genetics and Society (TIGS) and Biotech Consortium India Limited (BCIL), August 10, **2021**.
- [55] First Virtual Indo-German Meeting, Talk: Social life of a nucleophile. April 24, **2021**.
- [54] 8th Indian Peptide Symposium, IISc Bangalore, March 24-26, **2021**.
- [53] iMed.Ulissboa Seminar, Pharmacy Faculty, Lisbon University, March 19, **2021**.
- [52] Colloquium Series, Department of Chemical and Physical Sciences, University of Toronto Mississauga, March 17, **2021**.

- [51] Colloquium on "Peptide Chemistry," DRILS Hyderabad, January 8, **2021**.
- [50] XVI-J-NOST (first virtual) Symposium, IISc Bangalore, Ethics in Science, October 31-November 1, **2020**.
- [49] IICE Entrepreneurship Talk at IISER Bhopal, Values of entrepreneur filters in the selection of translational research problem, October 23, **2020**.
- [48] 3rd ChemBioChem Virtual Symposium on Chemical Translational Biology, Chemical technologies empowering biologics with precision and modularity, October 14, **2020**.
- [47] Chemistry Department Talks, IIT Bombay, Organic chemistry with proteins enabling biology and medicine, September 18, **2020**.
- [46] Interactive Lecture at Hansraj College, Delhi University, Science-T: opportunities for chemistry researchers, August 22, **2020**.
- [45] ACS Science Talks - Virtual Lecture Series, Organic chemistry with proteins creating opportunities in biology and medicine, August 14, **2020**.
- [44] CDRI MPC-Friday Seminar, Precision chemistry of native proteins enabling biology and medicine, CDRI Lucknow, July 31, **2020**.
- [43] International virtual conference, Chemical science for drug discovery and therapy, VNIT Nagpur, July 22-26, **2020**.
- [42] International virtual conference, Recent advances in organic, medicinal, and biological chemistry, VIT Chennai, July 8-9, **2020**.
- [41] PAC-SERB Webinar, Research Project Ideation & Innovation, July 6, **2020**.
- [40] SERB-VORTEX Conclave, IIT Bombay, Feb 13-14, **2020**.
- [39] RSC Roadshow, JNCASR, Bangalore, November 4, **2019**.
- [38] SPARC Workshop on Peptide and nanotechnological approaches for novel theranostics, Panjab University, Chandigarh, October 31, **2019**.
- [37] IIT Kanpur Organic Chemistry Symposium, Hyatt Regency, Lucknow, September 13-14, **2019**.
- [36] IICE-FITT Workshop, IISER Bhopal, July 24, **2019**.
- [35] Emerging Trends in Chemistry (IIT Indore 10th year celebration), IIT Indore, July 12-15, **2019**.
- [34] R&D Center, Thermo Fisher Scientific, Rockford, IL, USA, June 17, **2019**.
- [33] Department of Chemistry, Boston College, Boston, MA, USA, June 7, **2019**.
- [32] IIT Bombay Faculty Alumni Network symposium on new and advanced materials and sustainable sciences, Hotel Taj Exotica, Goa, April 6, **2019**.
- [31] Recent Advances in Organic and Bioorganic Chemistry Symposium (RAOBC), IISER Mohali, March 22-24, **2019**.
- [30] IIT Bombay Diamond Jubilee Chemistry Symposium, Mumbai, February 25-28, **2019**.
- [29] INYAS-FoS, Pragati Resort, Hyderabad, December 9-11, **2018**.
- [28] FICS-2018, Department of Chemistry, IIT Guwahati, December 6-8, **2018**.
- [27] Molecular Biophysics Unit, Indian Institute of Science, Bangalore, November 27, **2018**.
- [26] NOST-OCC 2018, XIX Organic Chemistry Conference, Grand Hyatt, Goa, September 6-9, **2018**.
- [25] CRSI-NSC-23, IISER Bhopal, Bhopal, July 13-15, **2018**.
- [24] National symposium on bioactive compounds, challenges, and opportunities for chemists, Khalsa College, Mumbai, June 22, **2018**.
- [23] Department of Chemistry, IIT Bombay, Mumbai, June 21, **2018**.
- [22] DST-DBT-SERB Joint Conclave, Jaipur, June 8-10, **2018**.
- [21] Invictus Oncology Private Limited, New Delhi, March 31, **2018**.
- [20] SCIEX Centre for Analytical Science, Gurgaon, March 30, **2018**.
- [19] Symposium: Peptides in Biology and Material Science, Shankarpur, Kolkata, February 22-23, **2018**.
- [18] 2nd ACS Industry Symposium, Mumbai, December 14-15, **2017**.
- [17] UK-India Newton Research Links Workshop, IIT Kanpur, November 6-8, **2017**.

- [16] RSC-NOST Symposium, Leeds, UK, October 3-6, **2017**.
- [15] NOST Symposium, IISER Bhopal, August 24-26, **2017**.
- [14] Gordon Research Conference, Andover, NH, USA, June 11-16, **2017**.
- [13] Indian Peptide Society Symposium, HBCSE Mumbai, Feb 23-24, **2017**.
- [12] preICOS Conference, IISER Bhopal, Dec 9, **2016**.
- [11] IVP Nurturance Program, IISER Bhopal, Dec 2, **2015**.
- [10] Chemical Frontiers, Goa, August 15-18, **2015**.
- [9] Emerging Trends in Chemical Sciences, IISER Bhopal, June 25-26, **2015**.
- [8] TIFR-DCS Seminar, TIFR Mumbai, June 8, **2015**.
- [7] ABM-2015, IISER Bhopal, Jan 10-11, **2015**.
- [6] GJIHS-2014, IIT Bombay, Mumbai, Oct 16-17, **2014**.
- [5] Kaleidoscope, The International Centre Goa, Goa, July 3-6, **2014**.
- [4] NCERT Nurturance Programme, IISER Bhopal, Bhopal, Dec 9-13, **2013**.
- [3] RSC- West India IYC-Challenge Symposium 2012, Nagpur, Aug 31 - Sept 1, **2012**.
- [2] 37th BSC, BRNS Meeting, BARC, Mumbai, Apr 12, **2012**.
- [1] Department of Chemistry, IIT Bombay, Mumbai, Dec 19, **2011**.

#### **Poster Presentations**

- [7] DIN theory enabling precision engineering of proteins and antibodies, Gordon Research Conference – Bioorganic Chemistry, Andover, NH, USA, June 9-14, **2024**.
- [6] Chemical technologies for precision engineering of proteins, FORCE-IICS-2024, Hyatt Regency, Kathmandu, Nepal, September 28 – October 1, **2023**.
- [5] Precision chemical tools for protein engineering, Gordon Research Conference - Bioorganic Chemistry, Andover, NH, USA, June 9-14, **2019**.
- [4] Native proteins can be labeled at single-site using chemical methods, UK-India, Newton-Bhabha Fund Researcher Links Workshop, IIT Kanpur, November 6-8, **2017**.
- [3] Chemical platforms for single-site labeling of native proteins, RSC-NOST Symposium, Leeds, UK, October 3-6, **2017**.
- [2] Organic chemistry with proteins, XVIII-NOST-OCC, IISER Bhopal, August 24-26, **2017**.
- [1] Single-site chemical modification of un-engineered proteins, Gordon Research Conference - Bioorganic Chemistry, Andover, NH, USA, June 11-16, **2017**.

#### **Other Services:**

- [19] Head, Department of Chemistry, IISER Bhopal, 2023
- [18] Advisory Board Member, Chemical Science, RSC, UK, 2023
- [17] Editor-in-chief search committee, ACS, USA, 2022
- [16] Council member, NOST, India, 2022
- [15] Coordinator & Committee Member, FORCE-IICS, 2022
- [14] Early career board member, ACS Chemical Biology, 2020
- [13] National Co-Chair (India), International Chemical Biology Society (ICBS), June 2021-May 2024
- [12] Co-opted Expert Committee Member, SERB (SRG, NPDF, ECRA), 2021
- [11] Invited member, SERB-POWER, 2021
- [10] Invited member, SERB-SUPRA, 2021
- [9] Invited member, NPDF, 2020
- [8] Invited member, PMRF committee, 2020
- [7] Invited member, SERB-PAC Chemical Sciences, 2020
- [6] Invited member, SERB-PAC Biological Sciences, 2020
- [5] Invited member, SERB-COVID19 task force, 2020

- [4] IISER representative for KVPY Aptitude Test, IISc Bangalore, 2012
- [3] Founder, Director, Plabeltech Private Limited, 2018 – till date
- [2] Head, Computer Center, IISER Bhopal, 2012-2018
- [1] Administrative committees of Department of Chemistry, IISER Bhopal and IISER Bhopal, 2011-till date organizational duties.

#### **Editorial Contributions:**

- [3] Invited Guest Editor, Chemical Communications, RSC, special issue on "Protein Engineering" (2024)
- [2] Invited Guest Editor, Frontiers in Chemistry, special issue on "Bioconjugation Chemistry" (2022)
- [1] Invited Guest Editor, Frontiers in Chemistry, special issue on "Bioconjugates for Drug Delivery" (2021)

#### **Organization of Scientific Activities:**

- [15] Coordinator, GVS on Targeting Proteins in ACS Spring Meeting, San Diego, USA, March 23-27, 2025
- [14] Co-Convenor: FORCE-IICS 2024 Symposium, Uday Backwater Resort, Alappuzha, Oct 3-6, 2024
- [13] Organizing team member, all NOST activities, 2022-2025
- [12] Convener: FORCE-IICS 2023 Symposium, Hyatt Regency, Kathmandu, Sept 28 - Oct 1, 2023
- [11] Convener: CBM (Chemistry-Biology-Medicine) Symposium, IISER Bhopal, Feb 27, 2023
- [10] Co-Convenor: FORCE-IICS 2022 Symposium, Jaypee Palace Hotel, Agra, July 28-31, 2022
- [9] Convener: RSC-IISER Desktop Symposium on ChemComm, August 2021
- [8] Convener: Wiley publishing workshop, IISER Bhopal, 2019
- [7] Convener: Ramanujan conclave, IISER Bhopal, 2017
- [6] Organizing committee member: XVIII NOST-OCC Symposium, IISER Bhopal, 2017
- [5] Organizing committee member: SERB-PAC meeting, IISER Bhopal, 2017
- [4] Organization committee member: INSA meeting, IISER Bhopal 2015
- [3] Organization committee member: J-NOST symposium, IISER Bhopal, 2013
- [2] Organization committee member: XV NOST symposium, Agra, 2012
- [1] Co-convenor: Indo-German conference, IISER Bhopal, 2012

#### **Teaching Activities:**

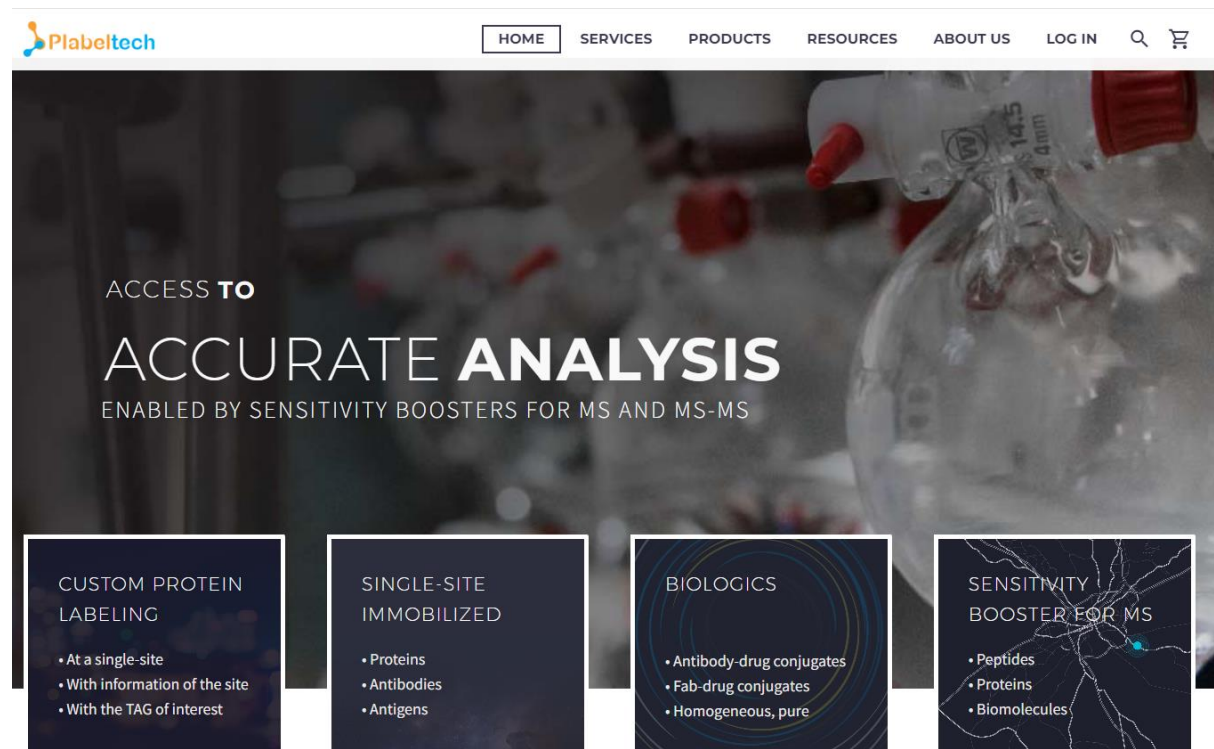
**Courses:** Basic Organic Chemistry (CHM 112), Laboratory Course in Organic Chemistry (CHM114), Basic Organic Chemistry (CHM 211), Organic Chemistry Laboratory II (CHM 311), Spectroscopy and its application to organic molecules (CHM 416/616), Advanced Organic Chemistry II (Organic Synthesis, CHM 612), Advanced Organic Chemistry I (Asymmetric Synthesis, CHM 613), Frontiers in Organic Chemistry (CHM 615), Chemical Biology (CHM 617)

**Distinguished teachers award and Director's appreciation letter** for Basic Organic Chemistry, Spectroscopy and its application to organic molecules, Advanced Organic Chemistry I (Asymmetric Synthesis), Frontiers of Organic Chemistry, and Chemical Biology.

*(Last updated: August 29, 2024)*

## Annexure 1: Details of commercialized technologies

The patents from Prof. Rai's work have led to the foundation of services and products at Plabeltech Private Limited. For more information, please visit: <https://plabeltech.com/>)

The image shows the homepage of the Plabeltech website. At the top is a navigation bar with the Plabeltech logo on the left and links for HOME, SERVICES, PRODUCTS, RESOURCES, ABOUT US, and LOG IN in the center. On the right of the navigation bar are search and shopping cart icons. The main banner features a background image of laboratory glassware and the text "ACCESS TO ACCURATE ANALYSIS" in large white letters, with "ENABLED BY SENSITIVITY BOOSTERS FOR MS AND MS-MS" in smaller text below. Below the banner are four service cards: "CUSTOM PROTEIN LABELING" (listing single-site labeling, site information, and TAG interest), "SINGLE-SITE IMMOBILIZED" (listing proteins, antibodies, and antigens), "BIOLOGICS" (listing antibody-drug conjugates, Fab-drug conjugates, and homogeneous pure substances), and "SENSITIVITY BOOSTER FOR MS" (listing peptides, proteins, and biomolecules).



## Annexure 1: Details of commercialized technologies

### Services

#### CUSTOMIZED PROTEIN LABELING



Protein engineering empowered by LDM platform, Gly-tag technology, and reactivity-hotspot technology.

Share your requirements and we will develop the desired tagged protein/antibody as per your needs.

We will label/tag your proteins with following attributes:

- homogeneous or precise single-site labeling
- information of the labeled site
- tag of your interest
- analytically pure (if desired)

##### Recent services

- mAb-FITC conjugation (fluorophore/mAb ~2-3)
- Ab-FITC conjugation (fluorophore/Ab ~2-3)
- Ab-biotin conjugation
- mAb-FITC conjugation

#### BIOLOGICS



Share your requirements and we will develop the desired antibody-drug conjugates (ADCs) as per your needs.

Homogeneous Fab-drug or antibody-drug conjugates with:

- antibody of your choice
- drug of your choice
- desired linker

Precision enabled by LDM and reactivity hotspot technological platforms

#### ORDERED IMMOBILIZATION ON THE RESIN



- single-site immobilized proteins
- single-site immobilized antibodies

Precision enabled by LDM, Gly-tag, and reactivity hotspot technological platforms

#### CUSTOMIZED TRAINING



Hand-holding for implementation of our technologies for your requirements. Training could be (a) online, (b) at Plabeltech facility, (c) at your laboratory.

- Protocol optimization, tailoring a product for your needs
- Customized training to your specifications

## Annexure 1: Details of commercialized technologies

### Products



#### MASPECTER: MS SENSITIVITY BOOSTER-PD1

₹21,500.00 – ₹39,950.00

Maspecter series product for peptide detection (MS).

- ✓ Easy to use mix and inject protocol
- ✓ Low concentration peptide detection in MS
- ✓ Femtomolar to attomolar detection

Pack Size

#### MASPECTER: MS SENSITIVITY BOOSTER-PS1

₹19,500.00 – ₹38,000.00

Maspecter series product for proteomics, peptide mapping (MS), sequencing (MS-MS).

- ✓ Easy to use mix and inject protocol
- ✓ Low concentration peptide detection in MS
- ✓ Enhanced peptide mapping in MS
- ✓ Enhanced and simplified fragmentation pattern in MS-MS

#### MASPECTER: MS SENSITIVITY BOOSTER-BC1

₹24,500.00 – ₹47,500.00

Maspecter series product for selective sensitivity enhancement of carbonyl (aldehyde/ketone) labeled sites in protein bio-conjugates.

- ✓ Selective enhancement of peptide with the carbonyl group in the digest
- ✓ Suppression of other peaks
- ✓ Enhanced and simplified fragmentation pattern in MS-MS

#### GLY-TAG PURIFICATION RESIN

₹24,900.00 – ₹48,000.00

The special functional group derivatized agarose provides robust purification and isolation of proteins with Gly residue at the N-terminus. The protocol is not dependent on the subsequent residue(s) giving unprecedented flexibility to the users. Additionally, no metal is used in the whole process.

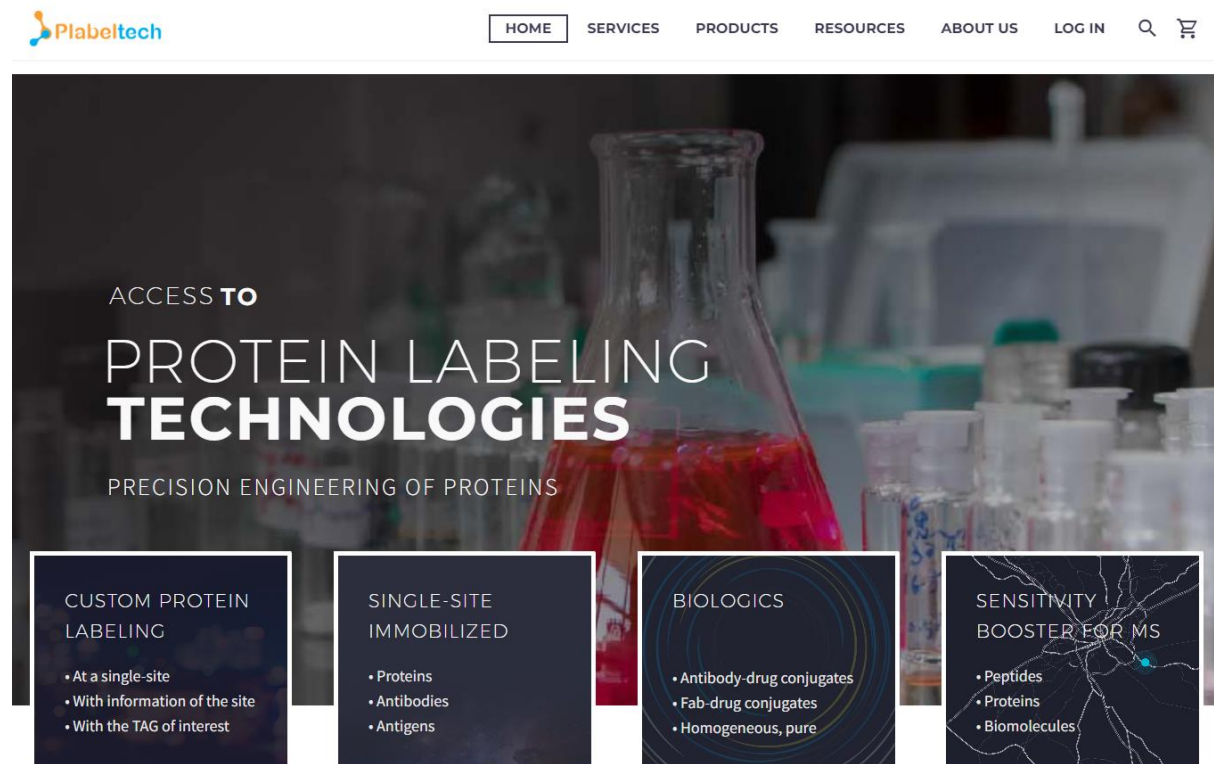
- ✓ NO metal contamination
- ✓ Cost-effective – recycle the resin multiple times
- ✓ High loading capacity
- ✓ Predictable and reproducible performance

Pack Size

## Annexure 2: Contributions to entrepreneurship

Prof. Rai is Founder and Director of **Plabeltech Private Limited**

(for details, see: <https://plabeltech.com>)



Plabeltech is working on two pipelines: a specific ADC for directed cancer chemotherapeutics (preclinical stage) and an AFC for image-guided tumor surgery (research stage). Besides, Plabeltech has agreements with multiple biopharma companies to meet their bioconjugation-associated technological demands.

### Annexure 3: Major facility/infrastructure developed

Prof. Rai is coordinator of **SERB-PACE** (for details, see: <https://serbpac.e.iiserb.ac.in>) and has been leading a team of researchers from IISER Bhopal, NCCS Pune, KGMU Lucknow, and industrial partners. The team with expertise ranging at the interface of Chemistry, Biology, and Medicine, is committed to contribute towards the national needs in the biopharmaceuticals.

