

## Dr. Swapan Kumar Biswas

FLAT NO. 507, KRISHTI PLAZA,  
KALIPARK GOPALPUR RAJARHAT,  
KOLKATA-700136

Phone: +91-890-247-7241(India)  
+91-908-843-8550(India)  
E-mail: [swapaniict@gmail.com](mailto:swapaniict@gmail.com)

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**Career Objective:** *I want to explore my knowledge in the field of synthetic organic chemistry as researcher, its application towards the mankind and want to do individual work, as well as collaboration work. I strongly believe that I can contribute in the growth and success of institute with my sincerity, experience and dedication.*

**Key Expertise:** Natural Product Synthesis, Asymmetric synthesis, Methodology Development, Peptide Synthesis, Medicinal Chemistry and Solid Phase Synthesis, NMR and HPLC analysis.

### **Teaching & Research Experience:**

- **December 2023-Till Date:**

**Associate Professor**, Department of Chemistry, Tripura University (A Central University), Agartala, Tripura, India.

Teaching PG student and Natural Product Synthesis, Asymmetric synthesis, Methodology Development, Peptide Synthesis, Medicinal Chemistry and Solid Phase Synthesis, NMR and HPLC analysis.

- **April 2015-November 2023:**

**Assistant Professor**, Department of Chemistry, Sree Chiatanya College, Habra, 24-Pgs(N), WB, India.

Teaching UG & PG student and Supervising PG project work.

- **September 2014-March 2015:**

Place: Jubilant Chemsys, Sector 58, Noida, India

Position: **Senior Research Scientist. Project Leader**

**Projects:**

- Asymmetric synthesis, Medicinal Chemistry and Contract research.

- **February 2013-August 2014:**

Place: TCG Lifesciences Pvt. Ltd, Kolkata, West Bengal, India.

Position: **Research Scientist. Project Leader**

**Projects:**

- Asymmetric synthesis, Medicinal Chemistry and Contract research.

- **July 2010-July 2012:**

Place: Montana State University, Bozeman, MT, USA.

Position: **Post-Doctoral Research** with Prof. Paul A Grieco.

**Projects:**

- Synthesis of highly water soluble zwitterionic fluorescent dyes for application in two-dimensional difference gel electrophoresis (2D-DIGE).
- Synthesis of thiotriphenylphosphene carboxylic acid derivative for RSNO rate determining project to bind the protein.

• **Aug 2009-Jun 2010:**

Place: Escientia BioPharma Pvt. Ltd, Nacharam Industrial Area, Hyderabad.

Position: **Senior Research Associate.**

**Projects:**

- Synthesis of Biologically active molecules, intermediates and process development for large scale reactions.

• **Feb 2006- Jul 2009:**

Place: Indian Institute of Chemical Technology, Hyderabad, India.

Position: Senior Research Scholar under the supervision of Dr. J. S. Yadav, FNA. **Projects:**

- Studies directed towards the synthesis of 2,3-dihydroxytrienitranes *via*-**Diels-Alder** Intramolecular cyclization, using **Julia-Kocienski** olefination and **Yadav's protocol** as the key steps.
- Gallium chloride catalyzed three component coupling of naphthol, alkyne and aldehyde: a novel synthesis of 1,3-dialkyl-3H-benzo[f]chromenes.
- Indium-mediated allylation/propargylation of  $\alpha$ -diazoketones: a facile synthesis of 1-bromo-2-alkyl- or 2-arylpent-4-en-2-ols and *vic*-diallylation/propargylation of phenacyl bromides: a facile synthesis of 4-arylocta-1,7-dien-4-ol derivatives.

• **Feb 2004-Feb 2006:**

Place: Indian Institute of Chemical Technology, Hyderabad, India.

Position: Junior Research Scholar under the supervision of Dr. J. S. Yadav, FNA.

**Projects:**

- IBX mediated facile conversion of 1,3 diols to 1,2 diketones by oxidative cleavage of C-C bond.
- Rapid and Efficient Protocol for the Synthesis of 4-chlorotetrahydropyrans using Niobium (V) chloride or Gallium halides.

• **Aug 2003-Jan 2004:**

Place: DABUR-Pharma, Kalyani Industrial Area, Kalyani, India.

Position: Process R&D Chemist.

**Projects:**

- Process R&D and production of **Irinotecan Hydrochloride as trihydrate** (IR-8), (FDA, TGA approved).
- **Nov 2002- Jun 2003:**  
Place: University of Kalyani, India.  
Position: M.Sc. Research project under the supervision of Prof. S. P. Das.  
**Projects:**
  - Isolation and Transformations of Triterpenoids.

### Education

Feb 2004-Jul 2009

Degree: Ph.D. in Organic Chemistry.

Institute: Degree awarded from University of Kalyani. Thesis title: *“Studies directed towards the synthesis of 2,3-dihydroxytrinervitanes and development of new methodologies”*

**2003**

Degree: **M. Sc. in Organic Chemistry.**

Institute: University of Kalyani, Kalyani, India.

**2001**

Degree: **B. Sc. in Chemistry** (Hons) with Physics and Mathematics as electives,

Institute: University of Kalyani, Kalyani, India.

### Awards & Fellowship

- Best Scientist award from TCG Lifesciences Kolkata-Roche Collaboration year 2013-2014
- Awarded *Senior Research Fellowship* (SRF) by the Council of Scientific & Industrial Research, New Delhi, India (2006-2009).
- Awarded *Junior Research Fellowship* (JRF) by the Council of Scientific & Industrial Research, New Delhi, India (2004-2006).
- Qualified *Graduate Aptitude Test in Engineering* by Indian Institute of Technology (2003).

### Professional Competence

- Synthesis of biologically active natural products and expertise in **multi-step synthesis**.
- Development of new methodologies for **organic synthesis**.
- Profound efficiency in **handling of hygroscopic and air sensitive reactions**.
- Synthesis of peptides liquid phase as well as solid phase.
- Expertised in **HPLC (Both analytical and preparative) and GC**.
- Analysis and handling instrument of spectroscopic data viz., **NMR, IR, UV and Mass spectrometer**.

- Capable of performing collaborative and independent work.
- Expertised in various analytical techniques in organic synthesis like flash chromatography, LC-MS, DSC, TGA and various other chromatographic techniques.
- Expertised in the preparation of research reports and manuscripts using MS office, ChemDraw, NMR software etc.
- Familiarised with SciFinder Scholar.

### **Publications**

1. **Dr. Swapan Kumar Biswas & Titas Biswas**, A Book for CBCS-UG& PG, Organic Name Reaction Rohini Nandan, ISSN/ ISBN No.978-93-91572-39-2
2. **Swapan Kumar Biswas\*** Sipak Joyasawal; Conversion of  $\alpha$ -Diazoketones into 1-Bromo-2-alkyl- or 2-arylpent-4-en-2-ols using Tin-Mediated Allylation/Propargylation. SynOpen 2023; 07(02): 161-164. DOI: [10.1055/a-2068-5625](https://doi.org/10.1055/a-2068-5625)
3. **Swapan Kumar Biswas\*** and Titas Biswas; Metal-free one-pot oxidative conversion: Molecular Iodine Mediated Oxidation Organic Reactions. Int. J. Exp. Res. Rev.Vol. 27: 45-52(2022). DOI: [10.52756/ijerr.2022.v27.005](https://doi.org/10.52756/ijerr.2022.v27.005).
4. **Swapan Kumar Biswas\*** and Titas Biswas; Utility of iodine catalyzed tandem oxidation, cross-coupling and cyclisation reactions in organic synthesis. Int. J. Exp. Res. Rev.Vol. 27: 39-44 (2022). DOI: [10.52756/ijerr.2022.v27.004](https://doi.org/10.52756/ijerr.2022.v27.004).
5. **Swapan Kumar Biswas\***; Recent development of Silver-catalyzed Oxo- and Aza cyclization.Int. J. Exp. Res. Rev., Vol. 26: 90-98 (2021). DOI: [10.52756/ijerr.2021.v26.007](https://doi.org/10.52756/ijerr.2021.v26.007).
6. **Swapan Kumar Biswas\*** and Debasis Das\*, One-pot Synthesis of Pyrano[2,3-c]pyrazole Derivatives via Multicomponent Reactions (MCRs) and their Applications in Medicinal Chemistry. Bentham Science, 552 - 568, Volume 19, Issue 5, 2022. DOI: [10.2174/1570193x19666211220141622](https://doi.org/10.2174/1570193x19666211220141622).
7. **Swapan Kumar Biswas\*** and Sushanta Saha, A report groundwater arsenic contamination assay in the delta area of West Bengal. International Academic Publishing House., Vol. 25: 84-88 (2021). <https://doi.org/10.52756/ijerr.2021.v25.008>.
8. Walid S. Maaty<sup>1</sup>, Joseph D. Steffens<sup>1</sup>, Joshua Heinemann<sup>1</sup>, Alice C. Ortmann<sup>2</sup>, Benjamin D. Reeves<sup>1</sup>, Swapan K. Biswas<sup>1</sup>, Edward A. Dratz<sup>1</sup>, Paul A. Grieco<sup>1</sup>, Mark J. Young<sup>3,4</sup> and Brian Bothner<sup>1\*</sup>, Global Analysis of Viral Infection in

an Archaeal Model System; *Frontiers in Microbiology*, 2012, Volume 3, Article 411, DOI: [10.3389/fmicb.2012.00411](https://doi.org/10.3389/fmicb.2012.00411)

8. J. S. Yadav, **S. K. Biswas**, S. Sengupta, Progress towards the total synthesis of 2,3-dihydroxytrinervitanes. *Tetrahedron Letters*, **2010**, *51*, 4014. DOI: [10.1016/j.tetlet.2010.03.065](https://doi.org/10.1016/j.tetlet.2010.03.065)

9. J. S. Yadav, B. V. S. Reddy, **S. K. Biswas**, S. Sengupta, Gallium chloride catalyzed three component coupling of naphthol, alkyne and aldehyde: a novel synthesis of 1,3-diaryl-3H-benzo[f]chromenes. *Tetrahedron Letters*, **2009**, *50*, 5798. DOI: [10.1016/j.tetlet.2009.07.134](https://doi.org/10.1016/j.tetlet.2009.07.134)

10. J. S. Yadav, B. V. S. Reddy, S. Sengupta, **S. K. Biswas**, Gallium(III) chloride catalyzed hydroarylation of aryl acetylenes with naphthols and phenols: a facile synthesis of vinyl arenes. *Synthesis* **2009**, 1301. DOI: [10.1055/s-0028-1088027](https://doi.org/10.1055/s-0028-1088027)

11. J. S. Yadav, B. V. S. Reddy, **S. K. Biswas**, S. Sengupta and P. Vishnumurthy Indium-mediated *vic*-diallylation/propargylation of phenacyl bromides: a facile synthesis of 4-arylocta-1,7-dien-4-ol derivatives. *Tetrahedron Letters* *49*, **2008**, 1034. DOI: [10.1016/j.tetlet.2007.12.005](https://doi.org/10.1016/j.tetlet.2007.12.005)

12. J. S. Yadav, B. V. S. Reddy, P. Vishnumurthy and **S. K. Biswas**, Indium-mediated allylation/propargylation of  $\alpha$ -diazoketones: a facile synthesis of 1-bromo-2-alkyl- or 2-arylpent-4-en-2-ols. *Tetrahedron Letters* *48*, **2007**, 6641. DOI: [10.1016/j.tetlet.2007.07.136](https://doi.org/10.1016/j.tetlet.2007.07.136)

13. J. S. Yadav, **S. K. Biswas**, R. Srinivas. IBX mediated facile conversion of 1,3 diols to 1,2 diketones by oxidative cleavage of C-C bond. *Synthesis*, **2006**, 4237. DOI: [10.1055/s-2006-950372](https://doi.org/10.1055/s-2006-950372)

14. J. S. Yadav, B. V. S. Reddy, B. Eeshwaraiah, M. K. Gupta, **S. K. Biswas**. Gallium (III) halide promoted synthesis of 1,3,5-triaryl-1,5-dihalo-1,4-pentadienes *Tetrahedron Letters* *46*, **2005**, 1161. DOI: [10.1016/j.tetlet.2004.12.080](https://doi.org/10.1016/j.tetlet.2004.12.080)

15. J. S. Yadav, B. V. S. Reddy, M. K. Gupta, **S. K. Biswas**. Rapid and Efficient Protocol for the Synthesis of 4-Chlorotetrahydropyrans using Niobium(V) chloride. *Synthesis*, **2004**, 2711. DOI: [10.1055/s-2004-831220](https://doi.org/10.1055/s-2004-831220).

#### **Presentations at symposium**

- Poster presented on “Synthesis 1-Bromo-2-alkyl- or 2-arylpent-4-en-2-ols using Tin-Mediated Allylation/ Propargylation” One Day National Seminar on Dimensions in

Chemical Sciences, held Dept. Of Chemistry And IQAC, RBC for Women, 16<sup>th</sup> May 2023.

- Poster presented on “One-pot Synthesis of Pyrano[2,3-c]pyrazole Derivatives via Multicomponent Reactions (MCRs) and their Applications in Medicinal Chemistry”, Science for Society Environment and Sustainability-2022, CSIR-North East Institute of Science and Technology, Jorhat, 24<sup>th</sup>-26<sup>th</sup> Nov 2022.
- “Production and application of Bio-Based Surfactants-A Breeff overview”, Trends in surface science and related Areas, 6th Oct, 2018, Sarojini Naidu Collge for women & ISSST, Jadavpur University,
- “Synthesis of Caspases Inhibitor to.....” NATCOBER-2017, 10-12 Nov, 2017, Sambalpur University
- Production and Application of Bio-Based surfactants-A Brief Overview” Trens in surface science and related areas, 20,Aug 2016 Sree Chitanya Collge & ISSST, Jadavpur University.
- Poster presented on “Studies directed towards the synthesis of 2,3-dihydroxy-trinervitanes *via* intramolecular Diels-Alder cyclization” in **National Symposium**, March, 2009 held at the University of Kalyani, Kalyani, West Bengal.
- Poster presented on “IBX mediated facile conversion of 1,3 diols to 1,2 diketones by oxidative cleavage of C-C bond” in **National Symposium on Current Trends In Chemistry** 30-31<sup>st</sup> January, 2007 held at the University of Kalyani, Kalyani, West Bengal.
- Poster presented on “Rapid and Efficient Protocol for the Synthesis of 4-chlorotetrahydropyrans using Niobium (V) chloride or Gallium chloride” in **OSPC-2005** held at the Indian Institute of Chemical Technology, Hyderabad.

## References

**Prof. Paul A Grieco**

Chemistry and Biochemistry Building,  
Montana State University  
P. O. Box 173400  
Bozeman, Montana 59717, USA

Phone: +1-406-994-7127

E-mail: [grieco@chemistry.montana.edu](mailto:grieco@chemistry.montana.edu)  
[pagrieco44@gmail.com](mailto:pagrieco44@gmail.com)

**Dr. J. S. Yadav**, FNA, FTWAS,

CSIR-Bhatnagar Fellow  
Indian Institute of Chemical Technology  
Hyderabad 500007  
Andhra Pradesh, India.

Phone: +91-402-719-3737

+91-944-080-2800

Email: 1) [yadav@iict.res.in](mailto:yadav@iict.res.in)

**Prof. Saktipada Das**

Professor in Chemistry  
University of Kalyani

Mobile no:+91-983-113-6264

E-mail: [sakti03@rediffmail.com](mailto:sakti03@rediffmail.com)

West Bengal, Kalyani-741235  
India

Place: Kolkata



Signature

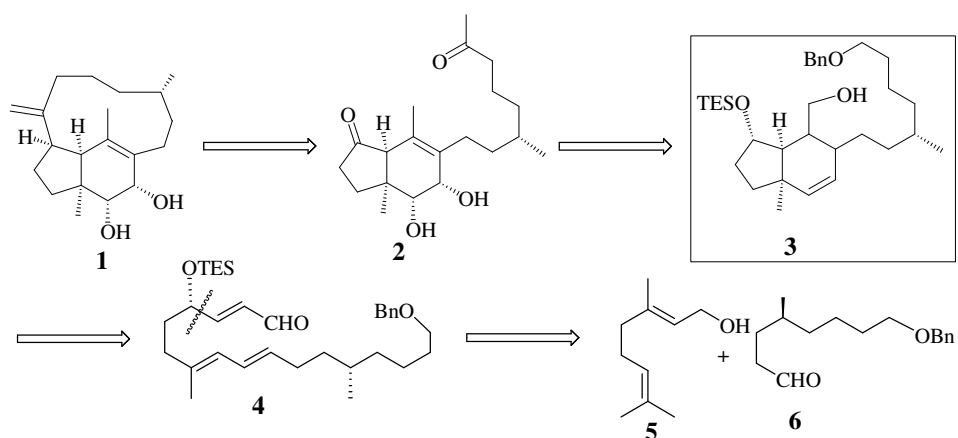
## SWAPAN KUMAR BISWAS

### BRIEF OUTLINE OF DOCTORAL RESEARCH WORK

**Studies directed towards the synthesis of 2, 3-dihydroxytrinervitanes *via* intramolecular Diels-Alder cyclization.** 2,3-dihydroxytrinervitanes a diterpenes has been isolated more than 30 years back, in spite of its unique structure and interesting biological activity; the total synthesis of the molecule is still remained unpublished.

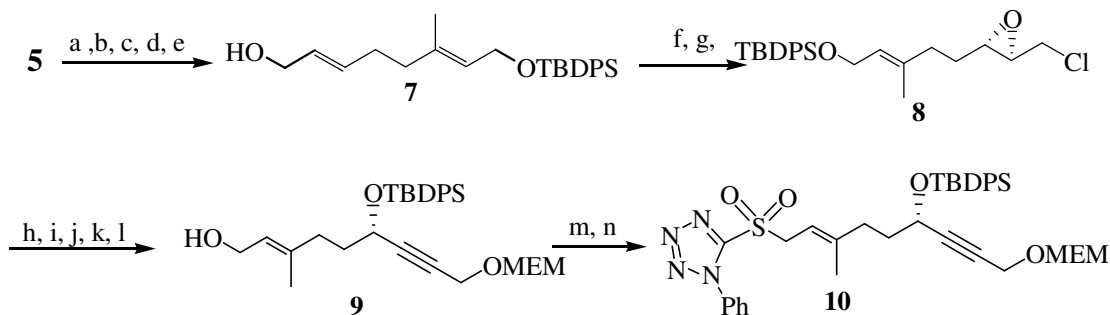
The compound has been completely characterized 2, 3-dihydroxytrinervitanes that is inhibitory at 25  $\mu$ g per mL, about 10 times less potent than a clinically practical antibiotic.

### Retro-Synthetic Approach



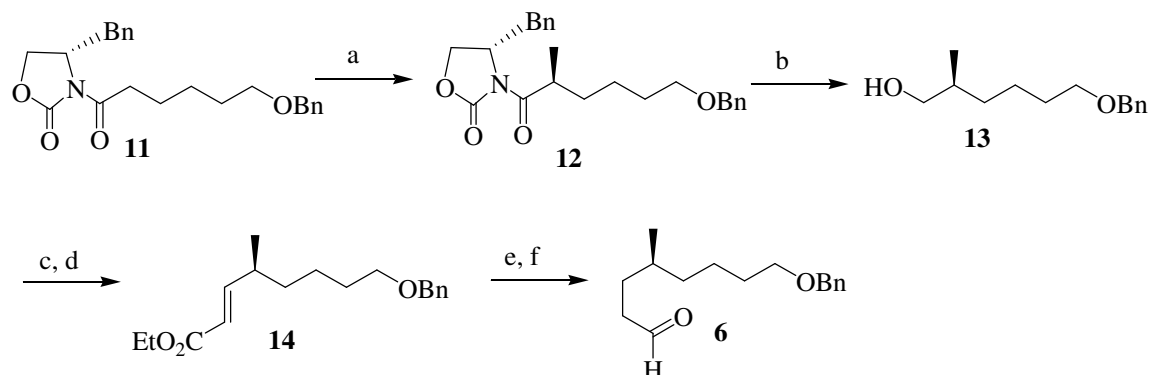
### Synthesis

**Fragment 1:** Geraniol has been converted to sulfone using periodic acid, C-2 Wittig, DIBAL-H reduction followed by Sharpless epoxydation, Yadav's protocol, Mitsunobu reaction and ammonium molybdate/ $\text{H}_2\text{O}_2$  as the key steps (Scheme 1).



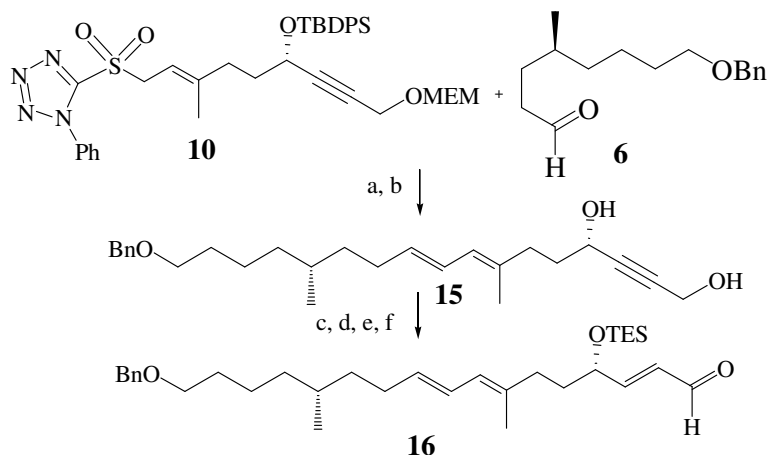
**Scheme 1:** a) TBDPS-Cl, Imd,  $\text{CH}_2\text{Cl}_2$ , b) m-CPBA,  $\text{CH}_3\text{Cl}$ , c)  $\text{H}_5\text{IO}_6$ , Ether, THF, d)  $\text{Ph}_3\text{PCHCO}_2\text{Et}$ ,  $\text{CH}_2\text{Cl}_2$ , e) DIBAL-H, Ether,  $-78^\circ\text{C}$ , f) Sharpless epoxydation,  $-20^\circ\text{C}$ , 4h, g)  $\text{CCl}_4$ , reflux at  $110^\circ\text{C}$ , cat.  $\text{NaHCO}_3$ , h) Li, Liq.  $\text{NH}_3$ , cat  $\text{Fe}(\text{NO}_3)_3$ , i) TBDPS-Cl, DMF, Imd, j) n-BuLi, THF,  $(\text{CH}_2\text{O})_n$ ,  $-78^\circ\text{C}$ ; k) MEM-Cl, DIEPA,  $\text{CH}_2\text{Cl}_2$ ,  $0^\circ\text{C}$  to rt; l) CSA, MeOH:  $\text{CH}_2\text{Cl}_2$  (1:1), 12h; m) DEAD, TPP, Tetrazol, THF; n)  $(\text{NH}_4)_2\text{MoO}_4$ ,  $\text{H}_2\text{O}_2$ , EtOH.  $0^\circ\text{C}$  to r.t.;

**Fragment 2:** Hexane diol was mono protected with benzyl group and converted to acid which was then coupled with Evan's auxiliary. After methylation with methyl iodide, removal of the auxiliary followed by C-2 Wittig,  $\text{LiBH}_4$  reduction and IBX oxidation resulted aldehyde **6** (Scheme 2).



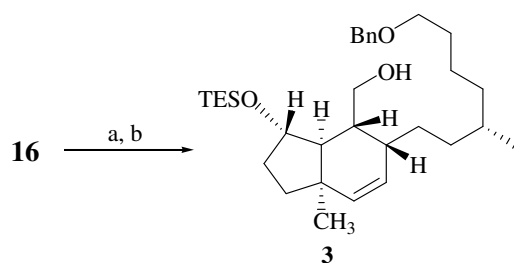
**Scheme 2:** a) MeI, NaHMDS, THF,  $-78^\circ\text{C}$ , b)  $\text{LiBH}_4$ , MeOH (1 drop  $\text{H}_2\text{O}$ ), c)  $(\text{COCl})_2$ , DMSO,  $\text{Et}_3\text{N}$ ,  $\text{CH}_2\text{Cl}_2$ , d)  $\text{Ph}_3\text{PCHCO}_2\text{Et}$ ,  $\text{CH}_2\text{Cl}_2$ , e)  $\text{LiBH}_4$ , THF,  $0^\circ\text{C}$  to r.t., f) IBX, DMSO, THF.

**Coupling and IMDA:** Diels-Alder precursor **16** was prepared as following, coupling of **10** and **6** using Julia-Kocienski olefination to get and followed by deprotection of TBDPS and MEM to get **15**, Red-Al reaction and protection deprotection of hydroxyl group followed by IBX oxidation to give IMDA starting material (Scheme 3).



**Scheme 3:** a) KHMDS, THF,  $-78^\circ\text{C}$ ; b) 2N HCL, MeOH; c) Red-Al, Ether; d) TES-Cl, Imd; e) TBAF,  $0^\circ\text{C}$  2 min; f) IBX, DMSO, THF, 1eq.  $\text{NaHCO}_3$ .

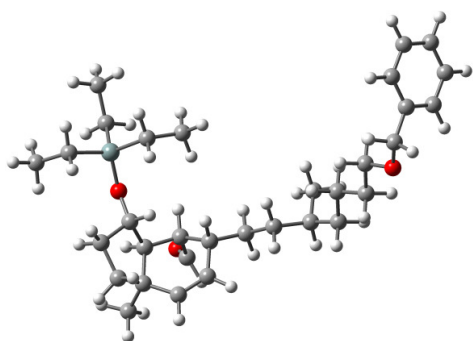
**16** was heated at  $160^\circ\text{C}$  for 20 hours to provide the five and six member ring of trinervitanes skeletons by **intramolecular Diels-Alder**, Which was converted to **3** using  $\text{NaBH}_4$  (Scheme 4). The structure was confirmed by NOESY interaction, quantum mechanical calculation supported the result.



**Scheme 4:** a) Toluene, 0.1 eqv BHT, 160 °C sealed tube 20h; b) NaBH<sub>4</sub>, MeOH, 0 °C.

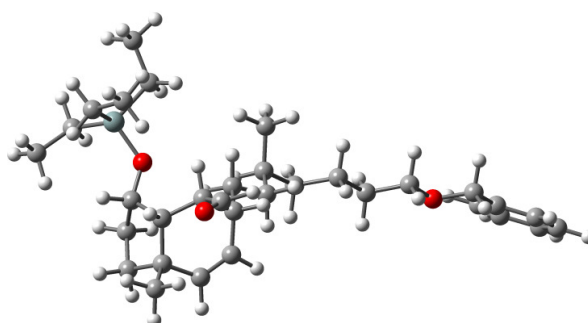
Total energies and the relative energies (kJ/mol) at AM1, PM3, MNDO and B3LYP/6-31G (d) level of theory.

Structure	AM1	PM3	MNDO	B3LY/6-31G(d)
<b>2a</b> ( $\alpha,\alpha$ )	0.0	0.0	0.0	0.0
<b>2b</b> ( $\beta,\beta$ )	18.3	22.8	15.0	5.14



Pr-2( $\alpha, \alpha$ ) -OSiEt<sub>3</sub> down

-1765.9314611 (0.0) kJ/ mol

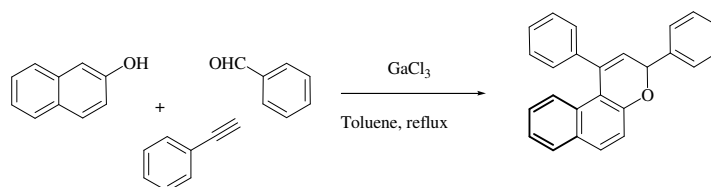


Pr-4 ( $\beta, \beta$ ) – OSiEt<sub>3</sub> down

-1765.926501 (5.14) kJ/ mol

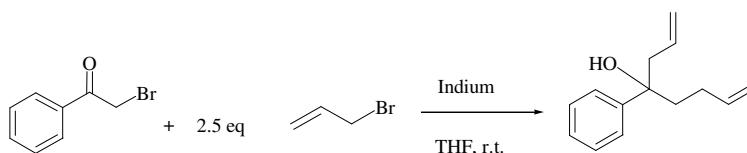
Yadav et al. *Tetrahedron Letters*, **2010**, 51, 4014.

**2) Gallium chloride catalyzed three component coupling of naphthol, alkyne and aldehyde: a novel synthesis of 1,3-dialkyl-3H-benzo[f]chromenes.** Three-component coupling of naphthol, alkyne and aldehyde has been achieved in the presence of 10 mol% gallium(III) chloride in toluene under reflux conditions to afford the corresponding 1,3-diaryl-3H-benzo[f]chromenes in good yields. This is the first example on the preparation of chromenes from naphthol.



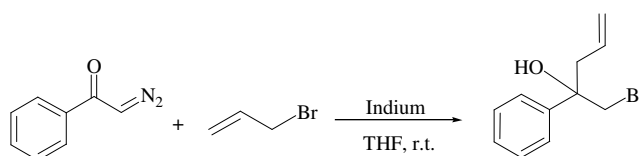
Yadav et al. *Tetrahedron Letters* **2009**, 50, 5798.

**3) Indium-mediated *vic*-diallylation/propargylation of phenacyl bromides: a facile synthesis of 4-arylocta-1,7-dien-4-ol derivatives.** Phenacyl bromides undergo smooth *vic*-diallylation and dipropargylation with allyl and propargylindium reagents generated *in situ* from metallic indium and allyl or propargyl bromide to produce 4-arylocta-1,7-dien-4-ol derivatives in good yields. Phenacyl chloride and azide also participated effectively in bis-allylation. Similar results are also obtained from in situ generated allyl or propargylzinc bromide.



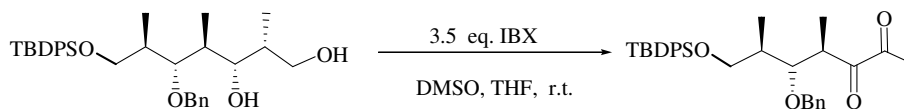
Yadav et al. *Tetrahedron Letters* **2008**, 49, 1034.

**4) Indium-mediated allylation/propargylation of  $\alpha$ -diazoketones: a facile synthesis of 1-bromo-2-alkyl- or 2-arylpent-4-en-2-ols.**  $\alpha$ -Diazoketones undergo smooth allylation with successive bromide insertion with allylindium bromide generated *in situ* from allyl bromide and indium metal to produce 1-bromo-2-alkyl- or 2-arylpent-4-en-2-ols in high yields. Addition of propargylindium bromide produces 1-bromo-2-alkyl- or 2-arylpent-4-yn-2-ols under similar conditions.



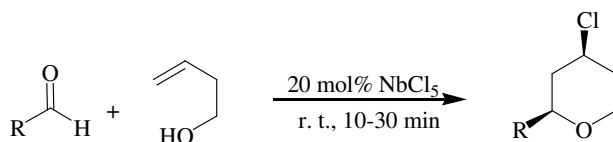
Yadav et al. *Tetrahedron Letters* **2007**, 48, 6641

**5). IBX mediated facile conversion of 1,3 diols to 1,2 diketones by oxidative cleavage of C-C bond.** For the first report, the direct conversion of 1,3-diols 1 to 1,2-diketones 2 by oxidative cleavage of the C-C bond using 3.5 equivalents of 2-iodoxybenzoic acid in dimethyl sulfoxide at ambient temperature.



Yadav et al. *Synthesis* **2006**, 4237.

**6). Rapid and Efficient Protocol for the Synthesis of 4-Chlorotetrahydropyrans using Niobium(V) chloride.** Aldehydes undergo a rapid coupling with 3-buten-1-ol utilizing 20 mol% of niobium(V) chloride or gallium(III) halides to afford 4-chlorotetrahydropyran or 4-halo-tetrahydropyran derivatives under extremely mild conditions within short reaction times in excellent yields with high selectivity. The similar halogenated tetrahydropyrans are also obtained using.

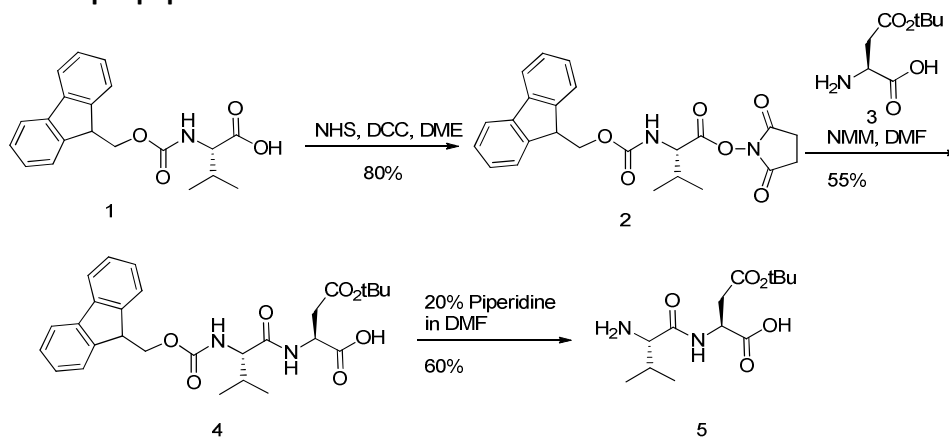


Yadav et al. *Synthesis* **2004**, 2711.

### Project at Montana State University:

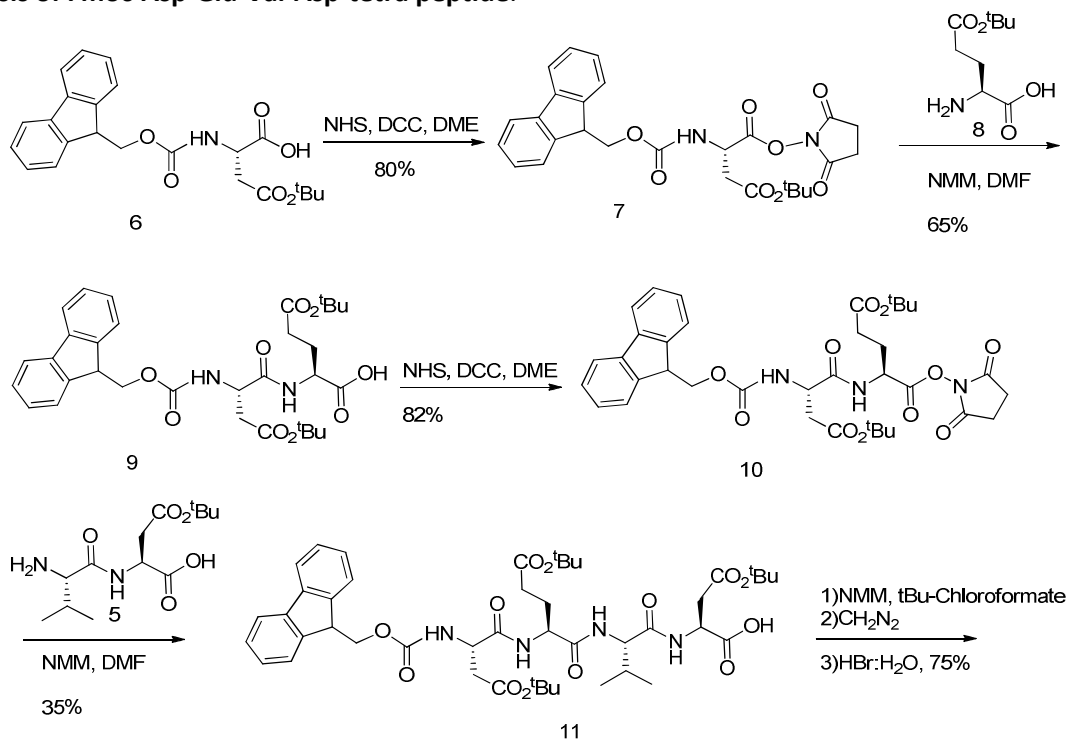
**Synthesis of Caspases Inhibitor:** Synthesis of highly water soluble zwitterionic fluorescent dyes (Zdye) for application in two-dimensional difference gel electrophoresis (2D-DIGE) to label the proteins from different biological treatments and thus overcome problems with experimental reproducibility of the separations of the myriad of proteins present in cells, organelles and in tissues. I have successfully completed Rhodamine Caspases inhibitor.

### Synthesis of Val-Asp dipeptide:



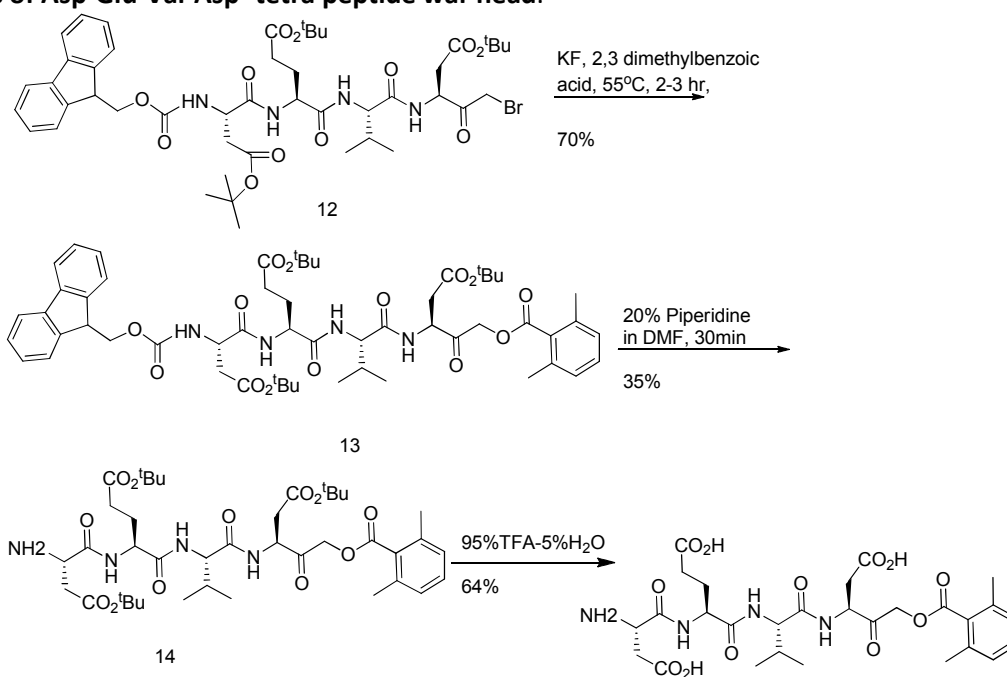
Scheme 1

### Synthesis of Fmoc-Asp-Glu-Val-Asp-tetra peptide:



Scheme 2

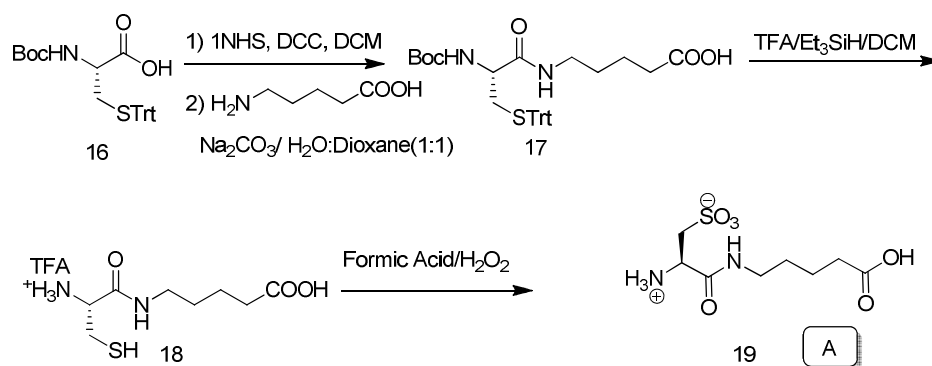
### Synthesis of Asp-Glu-Val-Asp- tetra peptide war head:



Scheme 3

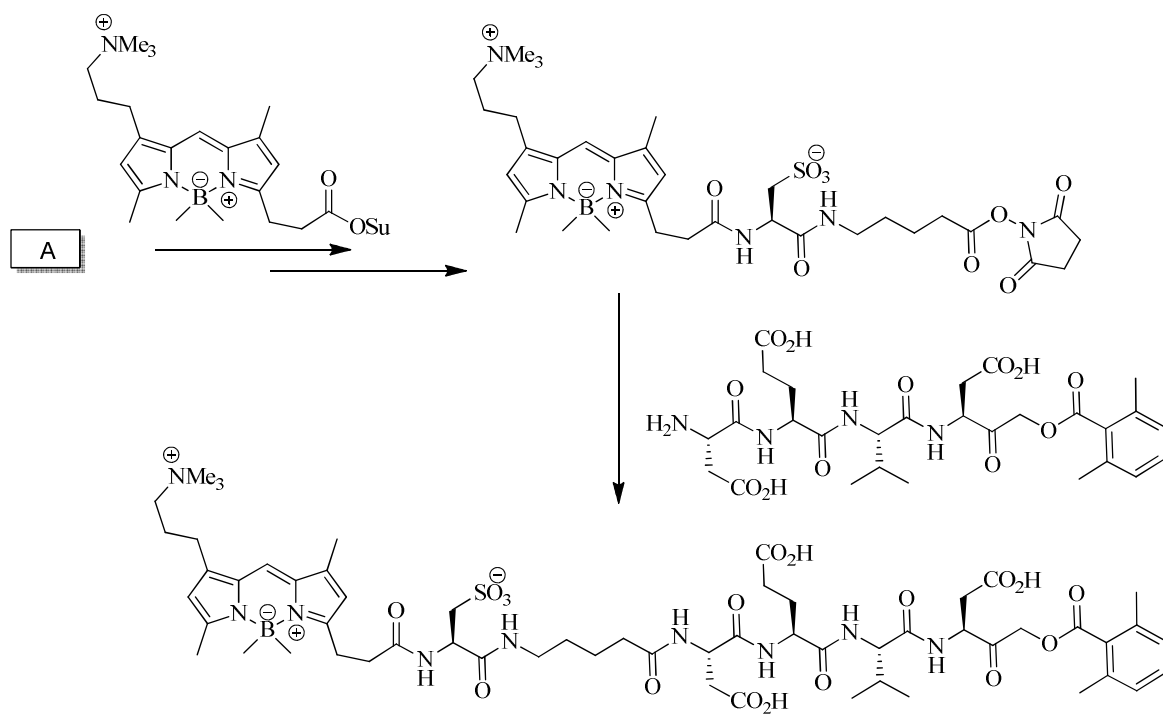
The tetra peptide with the war head is ready for the coupling with three set of Z dye for the experiment with caspases.

### Synthesis of Caspases Inhibitor side chain:



### Preparation of Rhodamine Caspases inhibitor:





Scheme 4