



生物有机与分子工程教育 部重点实验室

2003 年度工作报告

2003 年 12 月 29 日

2003 年工作总结

生物有机与分子工程教育部重点实验室在 2001 年重组以及 2002 年工作取得重要进展以后, 2003 年又进一步取得较好的成绩。目前实验室的主要科研工作集中在生物有机化学, 生物分析, 分子工程, 化学生物信息学及化学生物信息系统四个方向开展。围绕上述四个研究方向的 2003 年新增科研项目 14 项, 合同经费 552.2 万元。发表 SCI 收录学术论文 88 篇, 其中影响因子 3.0 以上的国际权威刊物论文 12 篇(包括化学领域最具权威性的美国化学会志 *JACS* 上发表 2 篇论文)。

实验室现有人员 21 人, 其中教授 12 人(含长江学者 2 人, 杰出青年基金获得者 4 人(其中杨震教授在今年获得国家杰出青年基金), 跨世纪人才基金获得者 2 人), 副教授 5 人, 讲师 2 人, 实验技术人员 2 人。在实验室 21 名固定人员中, 45 岁以下的年轻人占 68 %。

北大 211 工程以及 985 在 2003 年支持本实验室购置手性柱、GC-手性柱系统以及手套箱等共约 75 万元。

用于维持实验室运转的实验室主任基金的使用情况如下表:

总经费	实验室改建	论文奖励	杂费	实验室评估及开放基金	结余*
40 万	28 万	18.2 万	2.2 万	5.6 万	-14 万

*2001、2002 年主任基金结余 15.7 万元。

在人才培养方面, 2003 年度本实验室共计培养博士生 65 人, 其中已毕业 7 人; 硕士生 28 人。博士后 24 人, 其中出站 5 人。

尽管 2003 年的特殊情况, 我们也一如既往地积极进行与国内外同行的学术交流活动, 共邀请了 10 位国内外知名的学者前来讲学, 另外我室教师也积极参加国内外学术会议, 参加国际学术会议 3 人次, 参加全国性学术会议 2 人次。

2003 年教育部重点实验室评估

按照教育部科技司的要求, 我们重点实验室于 2003 年 12 月 3 日-4 日接受了专家组的评估。参加本次评估的共有化学类 7 个教育部重点实验室, 评估小组由 6 位专家(湖南大学姚守拙院士; 南京大学郭子建教授; 南开大学周其林教授; 华东理工大学田禾教授; 中山大学伍青教授; 北京科技大学孙冬柏教授)以及教育部科技司基础研究处李渝红处长。另有一位教育部的工作人员专门核对各类统计数据。

评估专家听取了主任工作报告以及三个代表性研究成果报告, 并且提出了若干的问题。专家对我们实验室比较关心的问题有这样几个方面: 1) 研究方向。经过实验室的重组, 目前主要的研究工作是有机合成化学。生物有机化学的内容比较少。评估专家在私下也提到这个问题。2) 经费支持比较少。由于本实验室在过去几年没有能够主持大的项目, 因此总的经费数比较少。3) 人员较少。尽管经过重组以后人员从 11 人增加到 21 人, 但是与教育部 50 人左右的规模要求有比较大的差距。4) 实验室的面积比较小。教育部要求 3000 平方米左右, 我们只

有大约 2000 平米。5) 学校的支持比较少。

总体来说评估专家对于我们实验室的高水平年轻队伍印象深刻，认为我们是最具有发展潜力的实验室。但同时也认为我们尚需要一段工作积累的时间。

整个评估的过程基本顺利进行。在评估的准备阶段许多工作得到重点实验室成员的积极参与和支持。实验室清理了环境，制作了重点实验室的展板以及重点实验室的宣传画册。这些工作为今后实验室的管理创造了条件。在评估中也暴露一些问题，有些工作由于直到评估前才知道，因此准备得比较匆忙。比如一些统计数据的证件等等。这些材料平时没有注意收集整理，这是以后需要改进的。

附件一、生物有机与分子工程教育部重点实验室专家评估意见
(2003年12月4日)

生物有机与分子工程教育部重点实验室(北京大学)在有机合成、生物有机化学以及有机分子工程学等方面取得了一批高水平的原创性成果。发现了新型有机锂试剂,并在此基础上发展了一系列新反应和新方法;对金属卡宾反应的机理进行了深入的研究,拓展了金属卡宾在有机合成中的应用;在富勒烯衍生物的合成、酶促多肽合成、DNA分子识别和切割等方面的研究成果也受到了同行的关注。

五年来,实验室共主持、承担了国家“973”、“863”、国家杰出青年基金、国家自然科学基金等国家级科研项目30余项;在SCI刊物上发表实验室署名论文84篇,其中包括《Angew. Chem. Int. Ed.》2篇,《J. Am. Chem. Soc.》2篇。

该实验室培养和引进了多名高水平的青年学术带头人,其中教育部“长江学者奖励计划”特聘教授2人,国家杰出青年基金获得者4人次,教育部跨世纪人才基金获得者2人次,形成了一支年轻的、具有很强竞争力的科研队伍。实验室五年中共培养博士研究生27人、硕士研究生34人,指导博士后7人。

依托单位对该实验室的建设和发展给予了一定的支持,五年中共投入建设经费860余万元,实验室已具备了从事相关研究的基本条件。

实验室学风严谨、学术氛围浓厚,具有很大的发展潜力,正在发展成为我国有机化学科学研究、高层次人才培养、对外开放和交流合作的重要基地之一。

存在问题:

1. 实验室仪器不足,部分仪器老化,亟需添置和更新。
2. 实验室面积不足,研究队伍规模偏小。
3. 实验室需加强规范化管理。

实验室进一步发展的建议:

1. 希望依托单位和主管部门加大对该实验室的投入,加强研究平台的建设,为开展高水平研究提供更好的条件。
2. 希望依托单位协助实验室做好研究队伍的整合工作,进一步提高实验室承担国家重大研究项目的能力。
3. 希望在学术委员会的指导下进一步明确实验室的定位和发展方向,向更高的目标努力。

附件二、2003 年来访讲学的国内外专家

- (1) George W. J. Fleet 教授; University of Oxford, UK
Huge Macrocycles and Mirror Image inhibitors from Sugar Lactones
2003 年 11 月 11 日
- (2) 金振东教授; 美国依阿华大学
Total Synthesis of Biologically Active Natural Products: Exploring Methods
and Strategies and Opportunities
2003 年 10 月 23 日
- (3) 李为东 教授; 兰州大学化学化工学院
三尖杉碱的全合成
2003 年 9 月 12 日
- (4) 逸伟博士 Department of Chemistry, The Scripps Research Institute, La Jolla,
USA
Total Synthesis of Apoptolidin and Synthesis of the Proposed Azaspiracid-1
Structure
2003 年 9 月 22 日
- (5) Julius Rebek 教授; The Skaggs Institute for Chemical Biology (所长), The
Scripps Research Institute, USA
Molecular Assembly and Encapsulation
2003 年 11 月 12 日
- (6) Richard J. K. Taylor 教授; The University York, UK
Tandem Oxidation Processes
2003 年 1 月 9 日
- (7) 谢作伟教授; 香港中文大学化学系
Group 4 Metal Carborane Constrained-Geometry Complexes:
Synthesis, Structure, and Olefin Polymerization Behavior
2003 年 10 月 15 日
- (8) Zuchun Zhao 博士; Metabolex Inc. USA
Part 1. Synthetic studies of marine natural products halichlorine and Pinnaic
Acid; Part 2. Design and synthesis of potent and selective FXa inhibitors
2003 年 9 月 11 日
- (9) 蔡明道教授; 美国俄亥俄州立大学化学系与生物化学系
DNA Polymerase: from Chemistry to Biology
2003 年 11 月 10 日

(10) 叶涛 博士; 香港理工大学以及北京大学深圳研究生院
Problem-Solving in Total Synthesis of Natural Products
2003 年 10 月 23 日

附件三、2003 年重点实验室发表研究论文

1) Catalytic Asymmetric [2,3]-Sigmatropic Rearrangement of Sulfur Ylides
Generated from Carbenoids

Xiaomei Zhang, Ming Ma and Jianbo Wang

Chin. J. Org. Chem. **2003**, *23*, Suppl. 19.

2) Direct Asymmetric Aldol Type Reaction with Ethyl Diazoacetate: Stereoselective
Synthesis of α , β -Dihydroxy Esters

Mingyi Liao, Wengang Yao, Haitao Feng and Jianbo Wang

Chin. J. Org. Chem. **2003**, *23*, Suppl. 18.

3) Unusual Reaction of β -Hydroxy α -Diazo Carbonyl Compounds with
Trichloroacetonitrile (Cl₃CCN) and Sodium Hydride

Weifeng Shi, Nan Jiang and Jianbo Wang

Chin. J. Org. Chem. **2003**, *23*, Suppl. 17.

4) 1,2 Migration in Carbenoid and Carbene Reactions

Ming Ma, Nan Jiang, Weifeng Shi and Jianbo Wang

Chin. J. Org. Chem. **2003**, *23*, Suppl. 14.

5) An Efficient Synthesis of α -aryl β -amino Phosphonate Derivatives from
 α -diazophosphonate

Yonghua Zhao, Nan Jiang and Jianbo Wang

Tetrahedron Lett. **2003**, *44*, 8339-8342.

6) Unusual Reaction of β -Hydroxy α -Diazo Carbonyl Compounds with Cl₃CCN/NaH
and Rh(II)-catalyzed Reaction of β -Trichloroacetylamino α -diazo Carbonyl
Compounds

Weifeng Shi, Nan Jiang, Shiwei Zhang, Weiming Wu, Daming Du, and Jianbo Wang

Org. Lett. **2003**, *5*, 2243-2246.

7) Catalytic Asymmetric [2,3]-Sigmatropic Rearrangement of Sulfur Ylides generated from Carbenoids and Allenic 2-Methylphenyl Sulfide

Xiaomei Zhang, Ming Ma and Jianbo Wang

Chin. J. Chem., **2003**, *21*, 878-882.

8) Direct Catalytic Asymmetric Aldol-Type Reaction of Aldehydes with Ethyl Diazoacetate

Wengang Yao, Jianbo Wang

Org. Lett. **2003**, *5*, 1527-1530.

9) Study of the Rh₂(OAc)₄- or BF₃.OEt₂-Mediated Reaction of Thioacetic S-Acid with α -Diazocarbonyl Compounds

Wengang Yao, Mingyi Liao, Xiaomei Zhang, Hao Xu, Jianbo Wang

Eur. J. Org. Chem. **2003**, 1784-1788.

10) Catalytic Asymmetric S-H Insertion Reaction of Carbenoids

Xiaomei Zhang, Ming Ma and Jianbo Wang

Arkivoc, **2003**, (II), 84-91.

11) Catalytic Asymmetric [2,3]-Sigmatropic Rearrangement of Sulfur Ylides generated from Carbenoids and Propargyl Sulfides

Xiaomei Zhang, Ming Ma and Jianbo Wang

Tetrahedron: Asymmetry, **2003**, *13*, 891-895.

12) Synthesis of Enantiomerically Pure (*R*)-Spiro[4,5]decane-2,7-dione

Wengang Yao and Jianbo Wang

Chin. J. Org. Chem. **2003**, *23*, 546-549.

13) Rh(II)-Carbene Reaction Controlled by Conformation: Study on Rh(II) Complex Catalyzed Reaction of Diazoesters and Diazoamides

Zhaohui Qu, Weifeng Shi, Xianglin Jin, Jianbo Wang

Chin. J. Org. Chem. **2003**, *23*, 988-995.

14) Investigation on the Transition Metal and Acid Catalyzed Reaction of *b*-(*N*-Tosyl)amino Diazo Carbonyl Compounds

Nan Jiang, Zhihua Ma, Zhaohui Qu, Xiaoyu Xing, Linfeng Xie and Jianbo Wang

J. Org Chem. **2003**, *68*, 893-900.

15) A Novel Approach to Two-ring Fused Cyclopentenone Derivatives

Guisheng Deng, Xue Tian and Jianbo Wang

Tetrahedron Lett. **2003**, *44* (3), 587-589.

16) Alkyne and Ketone Induced Novel Cleavage of a C-C Bond and a C-Si Bond in Zirconacyclobutene-silacyclobutene Fused Ring Compounds

Tao Yu, Liang Deng, Changjia Zhao, Zhiping Li, and Zhenfeng Xi

Tetrahedron Lett. **2003**, *44*, 677-679.

17) FeCl₃-mediated Reaction of 1,4-Dilithio-1,3-dienes with Alkynes Affording Benzene Derivatives

Guotao Li, Hongyun Fang, Zhiping Li, and Zhenfeng Xi

Chin. J. Chem. **2003**, *21*, 219-221.

18) Reaction of Aluminacyclopentadienes with Aldehydes Affording Cyclopentadiene Derivatives

Hongyun Fang, Changjia Zhao, Guotao Li, and Zhenfeng Xi

Tetrahedron **2003**, *59*, 3779-3786.

19) Lewis Acid Mediated Reactions of Zirconacyclopentenes with Aldehydes Affording Homoallyl Ketones via Oppenauer-type Oxidation
Changjia Zhao, Jun Yan, and Zhenfeng Xi

J. Org. Chem. **2003**, *68*, 4355-4360.

20) Preparation of S-containing Heterocycles via Novel Reaction Patterns of Carbon Disulfide with 1-Lithiobutadienes and 1,4-Dilithiobutadienes
Congyang Wang, Jinglong Chen, Qiuling Song, Zhiping Li, and Zhenfeng Xi

Arkivoc, **2003**, *part (ii)* 155-164.

21) One-pot Four-component Synthesis of Tetrahydrofuran Derivatives Involving An Alkyne, An Ethylene and Two Aldehydes via CuCl-mediated Reactions of Oxazirconacyclopentenes with Aldehydes
Changjia Zhao, Jiang Lu, Jun Yan, and Zhenfeng Xi

Tetrahedron Lett. **2003**, *44*, 6895-6898.

22) Formation of stereodefined multiply substituted all-*cis* octatetraenes, tricyclo-[4.2.0.0^{2,5}]octa-3,7-dienes and pentalenes via CuCl or FeCl₃-mediated dimerization of 1-lithiobutadienes and 1,4-dilithiobutadienes
Guotao Li, Hongyun Fang, and Zhenfeng Xi

Tetrahedron Lett. **2003**, *44*, 8705-8708.

23) Novel chiral dibenzo[a,b]cycloheptadiene bisoxazoline and catalytic enantioselective cyclopropanation of styrene.
Du, Da-Ming*; Fu, Bin; Hua, Wen-Ting

Tetrahedron, **2003**, *59*(11), 1933-1938.

24) Synthesis of novel chiral polyamide macrocycles containing pyridyl side-arm and their molecular recognition properties
Chen, Xiao; Du, Da-Ming; Hua, Wen-Ting

Tetrahedron: Asymmetry, **2003**, *14*(8), 999-1007.

25) Studies on the synthesis of novel chiral naphthylene bisoxazoline ligands.

Wang, Zhan-Yue; Du, Da-Ming*; Wu, Di; Hua, Wen-Ting

Synth. Commun. **2003**, 33(8), 1275-1283.

26) Synthesis of novel chiral C₂-symmetric bisoxazoline ligands containing 2,5-di(*m*-substituted)phenyl-1,3,4-oxadiazole.

Xu, Dong-Cheng; Du, Da-Ming*; Ji, Nan; Wang, Zhan-Yue; Hua, Wen-Ting*.

Synth. Commun., **2003**, 33(14), 2563-2574.

27) Study of the fragmentation mechanism of novel functionalized macrocycles by Fourier transform ion cyclotron resonance mass spectrometry.

Chen, Hui; Du, Da-Ming; Hua, Wen-Ting; He, Meiyu*; Xin, Bin.

J. Mass Spectrom. **2003**, 38(8), 839-844.

28) Asymmetric Diels-Alder reaction catalyzed by novel chiral dibenzo[a, c]cycloheptadiene bis(oxazoline) metal complexes.

Fu, Bin; Du, Da-Ming*.

Chinese J. Chem., **2003**, 21(6), 597-599.

29) New advances of organic synthetic reactions and catalytic asymmetric reaction in ionic liquid media.

Du, Da-Ming*; Chen, X.; Hua, Wen-Ting.

Chinese J. Org. Chem. **2003**, 23(4), 331-343.

30) Studies on molecular recognition of amino acid derivatives by macrocyclic chiral phosphoramidates.

Du, Da-Ming*; Hua, Wen-Ting.

Chem. J. Chinese Univ. **2003**, 24(3), 442-448.

31) Synthesis and Crystal Structure of *N*-(1'-Phenyl-2'-hydroxyethyl)-2,3-naphthylenedicarboximide.

Wang, Zhan-Yue; Du, Da-Ming*; Wu, Di; Hua, Wen-Ting, Jin, Xiang-Lin.

Chem. Res. Chin. Univ., **2003**, 19(2), 160-164.

32) Reinvestigation the reaction of salicylic chloride with salicylic amide and X-ray crystal structure of a new macrocyclic polyester.

Du, Da-Ming*; Chen, Xiao; Hua, Wen-Ting; Jin, Xiang-Lin.

Chinese J. Struct. Chem. **2003**, 22(5), 452-457.

33) Synthesis and crystal structure of novel chiral *o*-hydroxyphenyloxazoline metal complexes.

Wu, Hai-Chen; Du, Da-Ming; Hua, Wen-Ting; Jin, Xiang-Lin.

Chinese J. Struct. Chem. **2003**, 22(2), 155-160.

34) Synthesis of Novel Chiral Dibenzo[a, c]cycloheptadiene Bis(oxazoline) and Catalytic Asymmetric Reactions.

Fu, Bin; Du, Da-Ming*; Wang, Jian-Bo.

Chinese J. Org. Chem. **2003**, 23(suppl.), 27.

35) Synthesis and Catalytic Asymmetric Reaction of Chiral Pyridine Prolinol Derivatives.

Chen, Xiao; Zhang, Yong-Xin; Du, Da-Ming*; Hua, Wen-Ting.

Chinese J. Org. Chem. **2003**, 23(suppl.), 25-26.

36) Fragmentation mechanisms of polyamides containing N-methylpyrrole and N-methylimidazole by electrospray ionization tandem mass spectrometry

Yuan G, Tang FL, Zhu CJ, et al.

RAPID COMMUN MASS SP, **2003**, 17 (17), 2015-2018.

37) Synthesis and photoinduced DNA cleaving activity of hairpin polyamide-chlorobenzenesulfonyl conjugate
Tang FL, Yuan G, Wang J

PHOTOCHEM PHOTOBIOLOG, **2003**, 78 (2), 175-179.

38) Synthesis of DNA-recognizing polyamides containing N-methylpyrrole and N-methylimidazole
Yuan G, Tang FL

ARKIVOC, **2003**, Part 2, 32-37.

39) Monitoring the synthetic reaction of a polyamide/peptide conjugate using electrospray ionization mass spectrometry
Zhu CJ, Yang XL, Cao SX, Yan Liu, Gu Yuan, et al.

RAPID COMMUN MASS SP, **2003**, 17 (8), 825-831.

40) Interactions of calf thymus DNA with short chain oligoamides
Du WH, Wang BH, Li ZF, Gu Yuan, et al.

THERMOCHIM ACTA, **2003**, 395 (1-2), 257-263.

41) Recent progress in DNA recognition molecules
Zhou J, Yuan G

CHINESE J ORG CHEM, **2003**, 23 (6), 526-541.

42) Synthesis and cleaving activity of DNA photocleaver containing bromoacetophenone
Li LH, Liu D, Tang FL, Yuan Gu, et al.

CHEM J CHINESE U, **2003**, 24 (8), 1430-1431.

43) 羟基磺酸、氨基磺酸和磺酰肽的合成.
许家喜

有机化学, **2003**, 23(1), 1-9.

44) Diastereospecific synthesis of (S,S)-2-substituted-4,4-diphenyl-3,1-oxazabicyclo[3.3.0]octanes.

Zuo, Gang; Zhang, Qihan; Xu, Jiayi.

Heteroat. Chem., **2003**, 14(1), 42-45.

45) Mass spectral fragmentation of (S,S)-2-substituted-4,4-diphenyl-3,1-oxazabicyclo[3.3.0]octanes: Ring contraction of pyrrolidine and 1,3-oxazolidine in mass spectrometry.

Xu, Jiayi*, Zuo, Gang.

Rapid Commun.Mass Spectrom., **2003**, 17(14), 1651-1656.

46) Preparation of high optically pure linear secondary alcohols via asymmetric reduction of prochiral ketones by borane.

Xu, Jiayi.; Su, Xianbin; Zhang, Qihan.

Tetrahedron: Asymmetry, **2003**, 14(13), 1781-1786.

47) Specific synthesis of azeto[1,2-d][1,5]benzothiazepin/diazepin-1-ones.

Huang, Xu; Xu, Jiayi.

Heteroat. Chem., **2003**, 14(6), 564-569.

48) Total Synthesis of Wedelolactone

Chuang Chuang Li, Zhi Xiang Xie, Yan Dong Zhang, Jia Hua Chen, and Zhen Yang

J.Org. Chem., **2003**, 68, 8500-8504.

49) Total Synthesis of Methyl Protodioscin: A Potent Agent with Antitumor Activity

Mao S. Cheng, Qian L. Wang, Quan Tian, Hong Y. Song, Yong X. Liu, Qiang Li, Xin Xu, Hong D. Miao, Xin S. Yao, and Zhen Yang

J.Org.Chem., **2003**, 68, 3658-3662.

50) Development of Thiourea-Based Ligands for the Palladium-Catalyzed Bis(methoxycarbonylation) of Terminal Olefins

Mingji Dai, Cuihua Wang, Guangbin Dong, Jing Xiang, Tuoping Luo, Bo Liang, Jiahua Chen, and Zhen Yang

Eur.J. Org. Chem., **2003**, 4346-4348.

51) Diversity Oriented Synthesis and Branching Reaction Pathway to Generate Natural Product-like Compounds

Yun Liao, Youhong Hu, Jie Wu, Qiang Zhu, Maryann Donovan, Reza Fathi, Zhen Yang

Current Medicinal Chemistry, **2003**, 10, 2285-2316.

52) Star-Shaped Polycyclic Aromatics Based on Oligothiophene-Functionalized Truxene: Synthesis, Properties, and Facile Emissive Wavelength Tuning

Jian Pei, Jin-Liang Wang, Xiao-Yu Cao, Xing-Hua Zhou, and Wen-Bin Zhang

J.Am.Chem. Soc., **2003**, 125, 9944-9945.

53) Extend π -Conjugated Dendrimers Based on Truxene

Xiao-Yu Cao, Wen-Bin Zhang, Jin-Liang Wang, Xing-Hua Zhou, Hua Lu, Jian Pei

J.Am.Chem.Soc., **2003**, 125, 12430-12431.

54) Synthesis and Relationships between the Structures and Properties of Monodisperse Star-Shaped Oligofluores

Xing-Hua Zhou, Ji-Chao Yan, and Jian Pei

Organic Letters, **2003**, Vol.5, No. 19, 3543-3546.

55) Application of DEPBT on the Synthesis of the Protected Dipeptides Containing Histidine with Unprotected Imidazole Group by Solution Method

SHEN, Hong-Yan; TIAN, Gui-Ling; ZHU, Wen-Jiang; HA, Sha; YE, Yun-Hua

Chin. J. Chem., **2003**, 21, 801-804.

56) Recent Progress in the Study on Enzymatic Reactions in Non-aqueous Media

SHEN, Hong-Yan; TIAN, Gui-Ling; YE, Yun-Hua

Chin. J. Org. Chem., **2003**, Vol. 23, No.3, 221-229.

57) Effect of the Properties of Organic Solvents and Water Content on the Enzymatic Synthesis of Derivatives of Dipeptides Containing *D*-Amino Acid Residue
SHEN, Hong-Yan; TIAN, Gui-Ling; YAN, Ai-Xin; JIA, Yan; HONG, Yi-Ying; YE, Yun-Hua

ACTA CHIMICA SINICA, **2003**, Vol.61, No.7, 1144-1148.

58) Identification of Fatty Acids and Other Volatile Components of *Mulgedium tatarica* by GC-MS Spectrometry
REN Yulin, ZHOU Yawei, YE Yunhua

北京大学学报 (自然科学版), **2003**, Vol.39, No.2,

59) Application of Pac Ester in Thioester Method for the Synthesis of Cyclopentapeptides
LIU Mian, TIAN Gui-Ling, YE Yun-Hua

Chin. J. Chem., **2003**, 21, 864-870.

60) Isolation and Identification of Novel Compounds from *Mulgedium tatarica* DC.
REN, Yu-Lin; ZHOU Ya-Wei; YE, Yun-Hua

Chin. J. Org. Chem., **2003**, Vol.23, Suppl., 39.

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