# 数据可视化 ——如何在论文中画出漂亮的插图 四川大学图书馆 制作: 魏丽敏





## 日常生活中的数据可视化











## 月亮周期的摄像图 日常生活中的数据可视化

## 伽利略于1616年关于月亮周期的绘图



#### 巴拉克•奥巴马的支持率

# 近期民意调查显示,民众对巴拉克•奥巴马在种族关系问题上的举措持有52%的支持率。这也是以下13个问题中他唯一获得多数支持的举措。在其中8个问题上他都获得了多数反对。





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| 1          | 2         | 3          | 4          |
|------------|-----------|------------|------------|
| 10.0, 8.04 | 10.0,9.14 | 10.0, 7.46 | 8.0, 6.58  |
| 8.0, 6.95  | 8.0,8.14  | 8.0, 6.77  | 8.0, 5.76  |
| 13.0, 7.58 | 13.0,8.74 | 13.0,12.74 | 8.0, 7.71  |
| 9.0, 8.81  | 9.0,8.77  | 9.0, 7.11  | 8.0, 8.84  |
| 11.0, 8.33 | 11.0,9.26 | 11.0, 7.81 | 8.0, 8.47  |
| 14.0, 9.96 | 14.0,8.10 | 14.0, 8.84 | 8.0, 7.04  |
| 6.0, 7.24  | 6.0,6.13  | 6.0, 6.08  | 8.0, 5.25  |
| 4.0, 4.26  | 4.0,3.10  | 4.0, 5.39  | 19.0,12.50 |
| 12.0,10.84 | 12.0,9.13 | 12.0, 8.15 | 8.0, 5.56  |
| 7.0, 4.82  | 7.0,7.26  | 7.0, 6.42  | 8.0, 7.91  |
| 5.0, 5.68  | 5.0,4.74  | 5.0, 5.73  | 8.0, 6.89  |
|            |           |            |            |



4个数据集的数字表示

4个数据集的图形标识

科学研究中的数据可视化





## 1986年1月28日美国挑战者号航天飞机升空后



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低温 (零下7度)

火箭密封胶圈失灵

导致燃料泄漏



Above, foot long loidles on a lower level of the Food Service Structure frame the attachment point where the Orbiter is attached to the external lark (arraw). Icing was even more extensive at upper levels of the service structure (upper right and below). At right below is a ground communications box (not used during launch) rendered inoperable by heavy ice.









2

#### HISTORY OF O-RING DAMAGE ON SRM FIELD JOINTS

|  |                   | Cross Sectional View           |                                |                                  | Top View                          |  |   |
|--|-------------------|--------------------------------|--------------------------------|----------------------------------|-----------------------------------|--|---|
| APT APT  | SRM<br>No.        | Erosion<br>Depth<br>(in.)      | Perimeter<br>Affected<br>(deg) | Nominal<br>Dia.<br>(in.)         | Length Of<br>Max Erosion<br>(in.) | Total Heat<br>Affected Length<br>(in.) | Clocking<br>Location<br>_(deg)          |
| 61A LH Center Field**<br>61A LH CENTER FIELD**<br>(51C LH FORWARD Field**<br>51C BH Center Field (nrim)*** |                   | None<br>NONE<br>0.010<br>0.038 | None<br>NONE<br>154.0<br>130.0 | 0.280<br>0.280<br>0.280<br>0.280 | None<br>4.25<br>12.50             | None<br>NONE<br>5.25<br>58.75          | 36*66*<br>338*-18*<br>163<br>354<br>354 |
| y' (51C RH Center Field (sec)***   | 158               | None                           | 45.0                           | 0.280                            | None                              | 29.50                                  | 275                                     |
| 41D RH Forward Field<br>41C LH Aft Field*<br>41B LH Forward Field  | 138<br>11A<br>10A | 0.028<br>None<br>0.040         | 110.0<br>None<br>217.0         | 0.280<br>0.280<br>0.280          | 3.00<br>None<br>3.00              | None<br>None<br>14.50                  | 351                                     |
| STS-2 RH Aft Field   | 28                | 0.053                          | 116.0                          | 0.280                            |                                   | 1.00                                   | 90                                      |

\*Hot gas path detected in putty. Indication of heat on O-ring, but no damage. \*\*Soot behind primary O-ring. \*\*\*Soot behind primary O-ring, heat affected secondary O-ring.

Clocking location of leak check port - 0 deg.

| 1. | 没有提供任何温度数据     |
|----|----------------|
| 2. | 没有对损坏程度定量      |
| 3. | 没有评估温度与胶圈损坏的关系 |

OTHER SRM-15 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY AND NO SOOT NEAR OR BEYOND THE PRIMARY O-RING.

SRM-22 FORWARD FIELD JOINT HAD PUTTY PATH TO PRIMARY O-RING, BUT AND NO SOOT BLOWBY. OTHER SRM-22 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY.

| BLOW BY HISTORY<br>SRM-15 WORST BLOW-BY |        | HISTORY | OF O<br>(DEGRE |        | MPERATURES |
|---|--------|---------|----------------|--------|------------|
| · 2 CASE JOINTS (80.), (110 ) ARC       | MOTOR  | MBT     | AMB            | O-RING | WIND       |
| O MUCH WORSE VISUALLY THAN SRM-22       | Dm-+   | 68      | 36             | 47     | IO MPH     |
|   | Dm - 2 | 76      | 45             | 52     | 10 mp4     |
| SRM 22 BLOW-BY                          | Qm - 3 | 72.5    | 40             | 48     | 10 m PH    |
| · 2 CASE JOINTS (30-40")                | Qm - 4 | 76      | 48             | 51     | 10 MPH     |
|   | SRM-15 | 52      | 64             | 53     | 10 MPH     |
| SRM-13 A, 15, 16A, 18, 23A 24A          | SRM-22 | 77      | 78             | 75     | 10 MPH     |
| O NOZZLE BLOW-BY                        |        |         |                |        |            |

只列出2次胶圈损坏(没有定量)时的温度数据 1.

2. 遗漏了其余22次发射的数据(其中7次有损坏,17次没有)

由Morton Thiokol传真到 NASA的13页纸中的2页



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## 胶圈损坏和温度的量化关系的分析表

| Flight | Date     | Temperature<br>°F | Erosion<br>incidents | Blow-by<br>incidents | Damage<br>index | Comments  |
|--------|----------|-------------------|----------------------|----------------------|-----------------|---|
| 51-C   | 01.24.85 | 53°               | 3                    | 2                    | 11              | Most erosion any flight; blow-by; back-up rings heated. |
| 41-B   | 02.03.84 | 57°               | 1                    |                      | 4               | Deep, extensive crosion.                                |
| 61-C   | 01.12.86 | 58°               | 1                    |                      | 4               | O-ring erosion on launch two weeks before Challenger.   |
| 41-C   | 04.06.84 | 63°               | 1                    |                      | 2               | O-rings showed signs of heating, but no damage.         |
| 1      | 04.12.81 | 66°               |                      |                      | 0               | Coolest (66°) launch without O-ring problems.           |
| 6      | 04.04.83 | 67°               |                      |                      | 0               |   |
| 51-A   | 11.08.84 | 67°               |                      |                      | 0               |   |
| 51-D   | 04.12.85 | 67°               |                      |                      | 0               |   |
| 5      | 11.11.82 | 68°               |                      |                      | 0               |   |
| 3      | 03.22.82 | 69°               |                      |                      | 0               |   |
| 2      | 11.12.81 |                   | 1                    |                      | 4               | Extent of crosion not fully known.                      |
| 9      | 11.28.83 |                   |                      |                      | 0               | 25. 1   |
| 41-D   | 08.30.84 | 70°               | 1                    |                      | 4               |   |
| 51-G   | 06.17.85 | 70°               |                      |                      | 0               |   |
| 7      | 06.18.83 | 72°               |                      |                      | 0               |   |
| 8      | 08.30.83 | 73°               |                      |                      | 0               |   |
| 51-B   | 04.29.85 | 75°               |                      |                      | 0               |   |
| 61-A   | 10.30.85 | 75°               |                      | 2                    | 4               | No erosion. Soot found behind two primary O-rings.      |
| 51-I   | 08.27.85 | 76°               |                      |                      | 0               | 2011 (Sec.14) (201                                      |
| 61-B   | 11.26.85 | 76°               |                      |                      | 0               |   |
| 41-G   | 10.05.84 | 78°               |                      |                      | 0               |   |
| 51-J   | 10.03.85 | 79°               |                      |                      | 0               |   |
| 4      | 06.27.82 | 80°               |                      |                      | 2               | O-ring condition unknown; rocket casing lost at sea.    |
| 51-F   | 07.29.85 | 81°               |                      |                      | 0               |   |



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什么是可视化

## 通过电脑对数据进行交互的可视表达以增强认知

是一个生成图形图像的过程 形成某个物体的感知图像 强化认知理解

目的是洞悉而非图像 发现,决策,解释,分析,探索,学习



# 图表帮助你

# 分析数据的本质和内在规律

巧妙地展示有意义的数据 防止对数据的曲解 鼓励读者比较不同的数据 吸引读者注意数据的实质 与数据统计和文字描述有机地整合



四川大学图七馆

1. 统计图













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细胞作用示意图











ChemDraw化学式绘图软件









Vesta晶体结构绘图软件









亮度、对比度、比例尺



## 科学论文图表的制作原则

- 规范:符合期刊要求,如单位、字体、坐标、图例、标题。
  简洁:科学论文图表尽量简单简洁,清楚地表达数据信息。
  美观:图表要简单且具有美感,关注配色、构图和比例。
  争业:图表类型的选择,能全面地反应数据的相关信息。
  - 插图整体要求
  - 论文插图制作流程及注意事项
    - 照片的拼接
    - 条带图片的拼接
      - 表格的拼接



# Nature 杂志对图片要求

For publication, we prefer to use **TIFF** and **EPS** files in PC format, preferably from Photoshop or Illustrator software. We can also accept Freehand 8, Canvas and CorelDraw (version 8 and above), but these files must be converted to postscript (EPS) format. For any figures submitted in Photoshop or TIFF format we require layered files to be sent whereby all text, arrows or additional attributes are placed on individual layers within the file. We can also accept Adobe PDF (output to print or press settings), native PowerPoint, Word and Excel\* files, provided that each figure element is editable (in these programs the elements should be 'ungrouped'). Please note however that these software packages only allow RGB colour file creation (not suitable for print production), and colour conversions from RGB to CMYK may have unpredictable results.

Ensure all placed or linked pictures are correctly embedded into your final figure files.

For **photographic type images**, Adobe Photoshop 6 is the minimum preferred form layers, please save your image in the native Photoshop format (**PSD**). If not, please also accept **JPEG** and **EPS**. The minimum acceptable resolution is 300 DPI.

#### File size and specifications

File sizes must be as small as possible, so that they can be downloaded quickly. The number of files should be limited to eight, and the total file size should not exceed 8MB. Individual files should not exceed 1MB. Please seek advice from the editorial office before sending files larger than our maximum size to avoid delays in publication.

Images should not exceed **640 x 480 pixels** (9 x 6.8 inches at 72 pixels per inch) but we would recommend **480 x 360 pixels** as the maximum frame size for movies. We would also recommend a frame rate of **15 frames per second**. All supplementary information must have its own legend and must be referred to in the manuscript. For **line art/charts/graphs** we prefer to work with Adobe Illus also accept Freehand 8, PDF, PostScript (up to Level 3), ChemI sheet) and TeX/LaTeX.

Avoid outputting JPEGs from SPSS/PASW Statistics (any versio DPI. Other **unacceptable** formats include: CorelDraw (prior to

#### **Colour images**

For printing purposes, all RGB colours need to be converted to should be aware that this can make colours less vibrant and si

#### Tables

Please submit tables in (editable) Word or Excel\* format at th setting Table rows in picture format and then saving the docu

\*Please ensure any MS Office 2007 files are set to 'compatibil

## Science 杂志对图片要求

To expedite publication of your paper, please follow these style guidelines in preparing your figures for your revised manuscript. Note that some of these instructions (with respect to format and resolution) differ from the instructions for figures with initial manuscript submission. You can download a copy of these files in Word or PDF format for printing using the links to the right.

[Important note: We cannot accept figures in prepared in Microsoft PowerPoint or Word format at the revision stage! Please adhere to the formatting guidelines in this document.]

Resolution. For manuscripts in the revision stage, adequate figure resolution is essential to a high-quality print and online rendering of your paper. Raster line art should carry an absolute minimum resolution of 600 dots per inch (dpi) and, preferably, should have a resolution of 1200 dpi. Grayscale and color artwork should have a minimum resolution of 400 dpi, and a higher resolution if possible.

Please note that these resolutions apply to figures sized at dimensions comparable to those of figures in the print journal. Reducing or enlarging the dimensions of a digital raster image will also change its resolution. For example, reducing the dimensions of an image by 50%, with no change in file size, will double its dpi resolution; doubling the dimensions of the image will cut resolution by 50%. Authors are encouraged to review past issues to gauge the approximate size their figures will take in the print publication, and set the resolution of their figures accordingly.



## Cell 杂志对图片要求

#### **Cell Press Figure Guidelines**

On this page we provide tools and guidelines for creating high-quality figure files that are optimized for submission via EES and production in the journal. Please review these guidelines and make sure that your figures meet our requirements. To optimize your figure files for production, we provide a link to an Adobe Acrobat Job Options file (see below) that you can use to create production-quality PDF files from many file types.

- · We prefer TIFF, PDF, EPS, or JPEG formats for electronic artwork.
- Our maximum file size is 20 MB per file.
- · Don't send figure panels as individual files.
- Each figure should be able to fit on a single 8.5 x 11 inch page.
- · For color figures, the resolution should be 300 dpi.
- · For black and white figures, the resolution should be 500 dpi.
- · For line-art figures, the resolution should be 1000 dpi.

#### FILES SIZES FOR ARTICLES UNDER REVIEW

For newly submitted articles or revisions still under review, please try to keep your figure files as small as possible (1-2 MB) so that editors and reviewers can more easily work with the files. If your article is accepted for publication, we will ask for higher quality production figure files.





插图整体要求

# 图片尺寸要符合规范 只接受指定格式的图片 tiff 插图上元素要求对位整齐 400dpi、500dpi 图片清晰度要求符合印刷要求 400dpi、500dpi 插图中相同类型的文字大小应统 7-12号字 文字字体符合要求并保持一致 Arial、TNR 线条粗细应统一 坐标轴0.1mm-0.4mm





- 期刊多为左右两栏 插图排版:
  - ① 半版图
  - ② 2/3版图
  - ③ 整版图



# 半版图

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International Community are the lossed still of the three types of cyteralisland polymer, and they maint in make throws much more effectively than compreserve from an "Day can be created all to such other, as well as to action filaments and excerning size, by persons called pice Size" and some commediate-flamout structures may be experiend matchly through interac-tions with micromologies or action filomouth. Many cell types assemblie intermediate Hamote is required to machanical strategies. For example airway aptibulial colic in which harmin intermediate Hamote form conwork that helps calls to easiet door stress". One class of widely expressed termediate filoment, consisting of polymerized surface lamine, contellusion to the machanical imaging of the ankaryotic machine, and place phoreflation of nuclear lamins by cyclin-dependent kinnen helps trigger machine secondarys-branch down at the beginning of rational". Unlike micro-tedistion and action (Barware)s, intermediate (Barware)s are not polarized and cannot support directional increments of molecular motion.

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Ishiah construction promonated along action related promot 21, App 21 and Arp50 binds to action and indicates the formation of new action fila-ments in one the takes of pro-existing filaments, thereby generating highly branched action filaments that forms entangled idendicity," actives/ke<sup>24</sup>. Nucleation promoting factors activate the Arp27 complex conducted branching. These factors are typically only found associated with many names aparts. An appendix of a vite films at an encode is contactly the data of the films of a vite films of a

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2/3版图



几个部分算作一张figure 总宽度12-15cm 高度<20cm 缝隙0.5mm-0.8mm 小图片用a、b、c、d等标注(或A, B, C,D)







# 几个部分算作一张figure 总宽度17cm 高度 < 20cm 缝隙0.5mm-0.8mm 小图片用a、b、c、d等标注(或A, B, C,D) 如果文字7pt字号无法排满建议用2/3版图</pre>



# Photoshop 和Illustrator结合

- PS: 裁切、校色、上色、测量、修补、抠图 格式: psd、jpeg、tiff、png等位图格式
- AI:拼排、写字、画线、标注、绘图
  格式:AI、pdf、eps、emf等矢量格式
  作图结束最后可导出成tiff格式供稿
  不要用AI打开psd,tiff,JPEG、png等位图格式







## 黑白照片,如电镜照片,电泳条带等 Tiff格式,分辨率300dpi,采用LZW无损压缩 Eps格式,辨率300dpi,文字等保持矢量特性







彩色照片,包括电镜照片、病理切片、荧光显微镜照片等 专指彩色照片,不包括以彩色印刷的图表类线条图 Tiff格式,分辨率300dpi,采用LZW无损压缩 Eps格式,分辨率300dpi,文字等保持矢量特性







包括彩色图片,黑白图片,柱状图等 Tiff格式,灰度图和彩色图片分辨率500dpi,采用LZW无损压缩 Eps格式,灰度图和彩色图分辨率500dpi,保持矢量特性







用电脑软件人工绘制的用以辅助反应课题设计、研究机制、实验通路等机理或者机制的彩图,多出现在高影响因子论文之中 Tiff格式,分辨率500dpi,采用LZW无损压缩 Eps格式,分辨率500dpi,文字等保持矢量特性



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图片色彩模式和字体

- 印刷要求使用CMYK格式,电子期刊要求使用RGB模式,具体查看投稿期刊的要求,灰度图请使用灰度模式,另外请使用8位图通道
- 字体类型Arial 或者Time News Roman字体
- 字体大小没有严格要求,但整篇论文中多幅插图中同类型的文字部分的字体大小应保持一致,原则上不超过14号字,尽量使用7-12号字,尽量少使用小于6号以下的字体,最多见的文字大小推荐使用7号字



图片压缩及文件大小

- 为了便于投稿时插图文件尽量快速的网络传输,建议对于 tiff格式图片统一采用LZW格式的无损压缩,否则高分辨 率(如1000bpi)的tiff格式线图大小甚至可以达到50MB, 线条图使用LZW格式压缩后大小改变十分明显,彩色照片 类图片进行LZW压缩后大小改变相对较小
- 单个图片大小最好不要超过10MB,如果经过LZW处理后的图 片大小仍超过10MB,意味着图片版面过大,需要从新制作 或者分成几个图片



## 插图文件格式

- TIFF格式: 位图。如使用photoshop编辑的插图, 导出tiff 格式图片时请拼合图层。
- EPS格式: 矢量图。其中可嵌入位图, 嵌入的位图需要保证 足够的分辨率(以400dpi为佳, 最低不低于300dpi)。
- 只接受这两种类型的插图文件格式。鼓励使用EPS矢量图格式,因为矢量图印刷出来的文字和线条最清晰。Tiff格式需要达到相应的分辨率。
- 不接受JPG格式的插图,不接受doc、ppt文档中的插图。





## 提交的文件名应使用相应的规范

- Figl.tiff, Fig2.tiff, Fig3.tiff....
- Figl.eps, Fig2.eps, Fig3.eps
- 如果一张图由几个部分组成,算作一张图,应在PS、AI等软件 中拼合成后提交,而不是提交诸如Fig1A.tiff、Fig1B.tiff



# 严禁出现的做法



**截屏图片电脑上显示合格 截屏图片印刷后模糊不堪 符合要求的印刷显示效果** 如果您现在查看的此文档是pdf格式,您可在pdf阅读软件中放大阅读视图比例到300%以上,然后对比ABC三图的显示效果。可见到C图是最清晰的

为达到指定分辨率而使用图片编辑软件强行放大 直接将软件输出的线条或者图表使用截屏后制作的插图 对图像做局部修改,属于伪造数据



# 何时编辑部要求提供原始照片和数据

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Figure 1 | Systematic profiling of marketed drugs on a representative panel of human gut microbial species. a, Broad impact of pharmaceuticals on the human gut microbiota. Compounds from the Prestwick Chemical Library are divided into drugs used in humans, drugs used exclusively in animals (vet) and compounds without medical or veterinary use (non-drugs). Human-use drugs are further categorized according to targeted organism. Strain-drug pairs (that is, instances in which a drug significantly reduced the growth of a specific strain; see Methods) are highlighted with a vertical coloured bar in the matrix. the right (boxes correspond to interquartile range (IQR) and central line to median relative abundance). **b**, Fractions of drugs with anticommensal activity by sub-category. Grey scale within bars denotes inhibition spectrum (the number of affected strains per drug). **c**, Correlation between species abundance in the human microbiome and drug sensitivity. For each strain (n = 40), the number of drugs that affect its growth is plotted against its median relative abundance in the human gut microbiome. Lines depict the best linear fit, **n**<sub>b</sub> the Spearman correlation and grey shading the 95% confidence interval of the linear fit. All drugs, and in particular

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Maier L, Pruteanu M, Kuhn M, et al. Extensive impact of non-antibiotic drugs on human gut bacteria[J]. Nature, 2018, 555(7698):623-628.



this disruption, and how it might promote disease, is poorly understood. Writing in *Cell*, Guo *et al.*<sup>5</sup> precisely map the organizational and structural features of poly(GA) aggregates and associated macromolecular complexes in neurons using a technique called 3D cryoelectron tomography (cryo-ET), to provide direct visualization of how proteasomes are disrupted by poly(GA) proteins.

Cryo-ET in 3D uses electron microscopy to view very thin, frozen but hydrated sections of a cell from various angles. The resulting images are combined to produce a 3D image called a tomogram. Guo et al. used 3D cryo-ET to visualize neurons that had been genetically engineered to express a poly(GA) tract that contained either 175 or 73 repeats. The tracts were fused with a green fluorescent protein that enabled their precise position to be determined using correlative light microscopy. The engineered protein mimics poly(GA) tracts that are produced from C9orf72 expansion, which take a long time to form in vivo. The authors found that poly(GA) proteins form highly clustered and often bifurcated twisted ribbon structures that are of relatively uniform thickness, but of variable length and width, similar to poly(GA) structures previously observed by conventional electron microscopy in vitro6.

computational approaches to search for known macromolecular complexes in each aggregate, a reaction cycle that involves ground, committed and substrate-engaged states. Guo





L Vaites Pontano, JW Harper. Protein aggregates caught stalling. [J]. Nature, 2018, 555(7697):449-451.



### Advances in Tetrazine Bioorthogonal Chemistry Driven by the Synthesis of Novel Tetrazines and Dienophiles

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**CONSPECTUS**: Bioorthogonal chemistry has found increased application in living systems over the past decade. In particular, tetrazine bioorthogonal chemistry has become a powerful tool for imaging, detection, and diagnostic purposes, as reflected in the increased number of examples reported in the literature. The popularity of tetrazine ligations are likely due to rapid and tunable kinetics, the existence of high quality fluorogenic probes, and the selectivity of reaction. In this Account, we summarize our recent efforts to advance tetrazine bioorthogonal chemistry through improvements in synthetic methodology, with an emphasis on developing new routes to tetrazines and expanding the range of useful dienophiles. These efforts have removed specific barriers that previously



limited tetrazine ligations and have broadened their potential applications.

Among other advances, this Account describes how our group discovered new methodology for tetrazine synthesis by developing a Lewis acid-promoted, one-pot method for generating diverse symmetric and asymmetric alkyl tetrazines with functional substitutions in action statement of the statement o

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Figure 3. (A-C) Fluorogenic reaction of 22-24 with dienophiles. (D) Live-cell imaging of LS174'T cells using fluorogenic probe 22. Left: cells were pretargeted with TCO-decorated A33 antibodies. Right: cells were treated with unmodified antibodies. (B) Structure of cyclopropene 25.

our tetrazine synthetic methodology in hand, we aimed to design a new generation of tetrazine fluorogenic probes.<sup>25</sup>

Since the double bond generated by the Heck reaction is the ideal bridge for energy transfer, we hypothesized that a have an inherent absorbance around 500-550 nm. Thus, farred and NIR fluorophores with relatively longer emission wavelengths are challenging to quench. Therefore, we decided to design a tetrazine near-infrared fluorogenic probe through a

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Variable dat concentrations. (a) Distinguish the target much non-two sarget mismatch variants. (1) ocquerces or proces and emplates. (5)







## **THANKS FOR YOUR ATTENTION**