# Wizualizacja danych

## Wykład 3: Fundamentalne zasady projektowania graficznego


Mariusz Tarnopolski

Instytut Astronomii UMK


DataViz, 2024/2025


https://brandingbyjuls.com/blog/f/12-essential-graphic-design-principles-you-need-to-know; https://www.zekagraphic.com/12-principles-of-graphic-design/

- W tradycyjnym projektowaniu graficznym (postery, ulotki, czasopisma, web dev) wszelkie ozdobniki (tj. elementy estetyczno-artystyczne) mają wzbudzać emocje, wywoływać skojarzenia, wyrażać ukryty przekaz itp.
- W DataViz nie ma miejsca na żadne ozdobniki: każdy element wykresu ma ilustrować dane/tezę lub ew. ułatwiać odbiorcy interpretację.
- Wg Tuftego celem jest maksymalizacja *data-to-ink ratio*.

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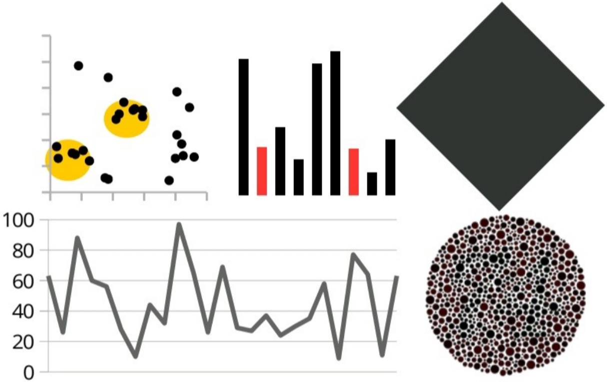
# Balans



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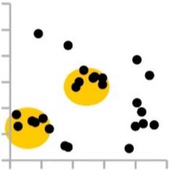

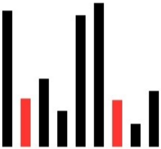


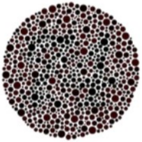

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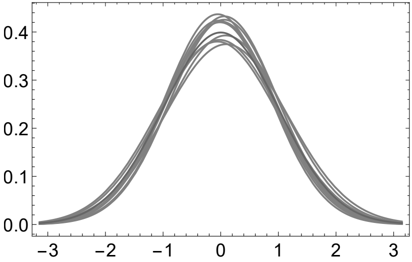

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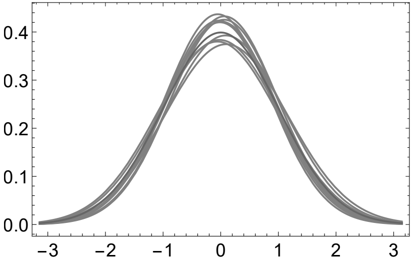


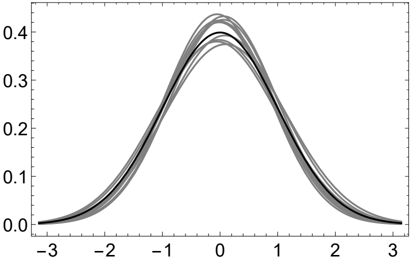

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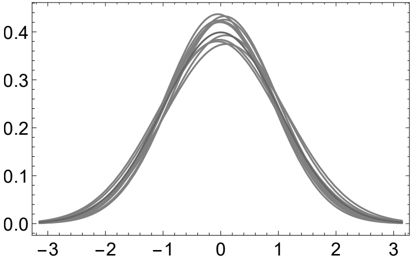


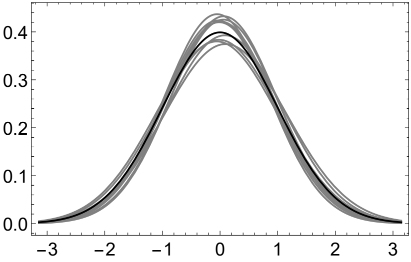


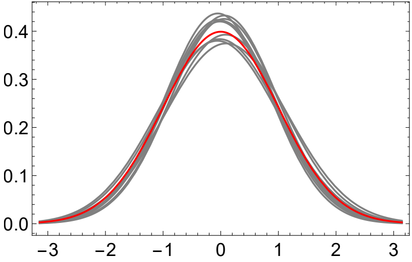

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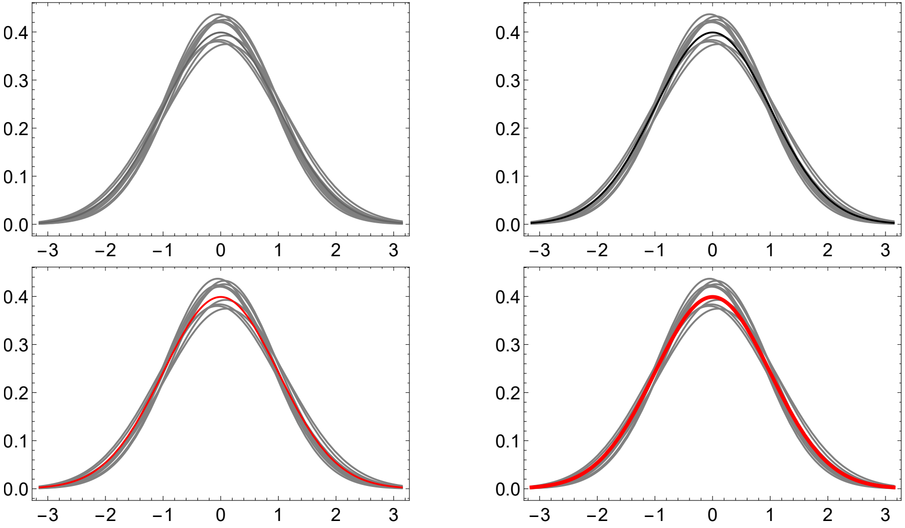

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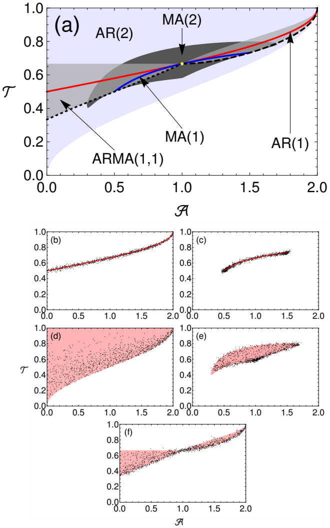


https://doi.org/10.1103/PhysRevE.100.062144

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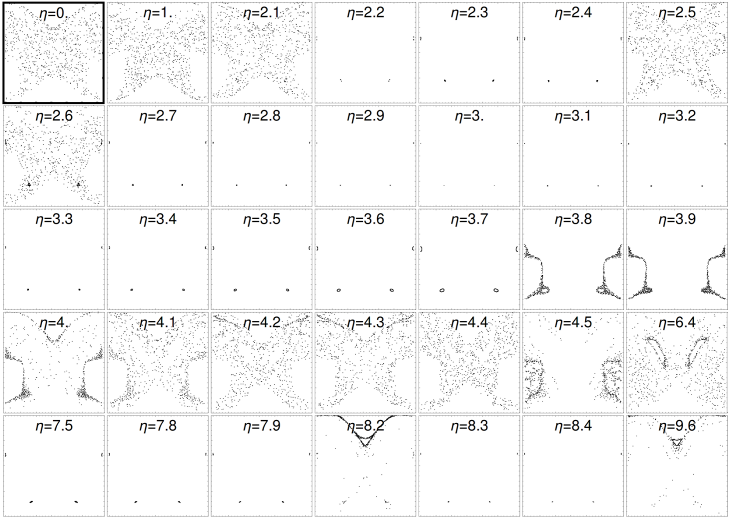


https://doi.org/10.1051/0004-6361/201731167

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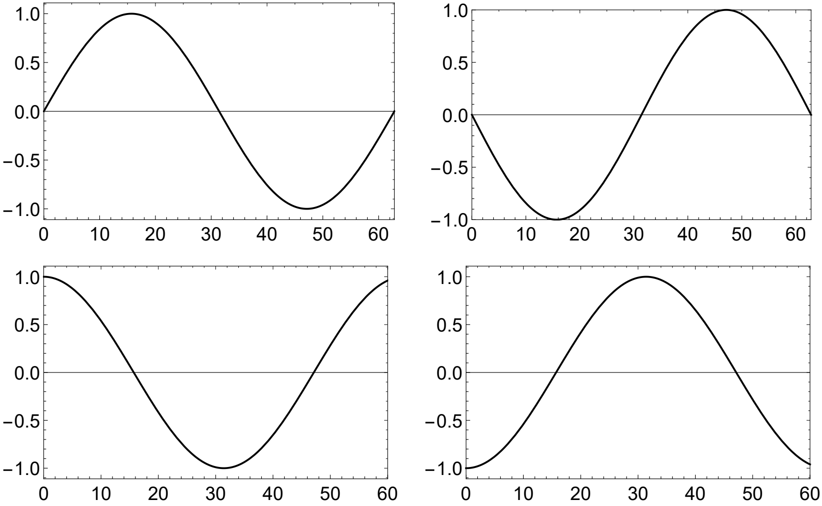

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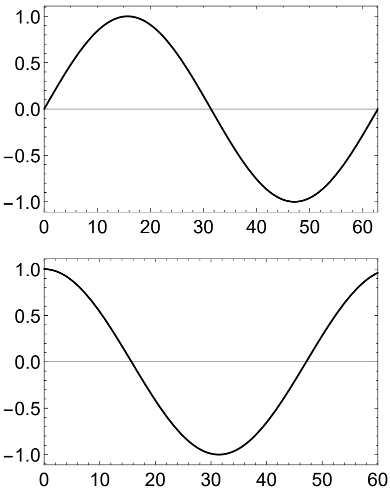

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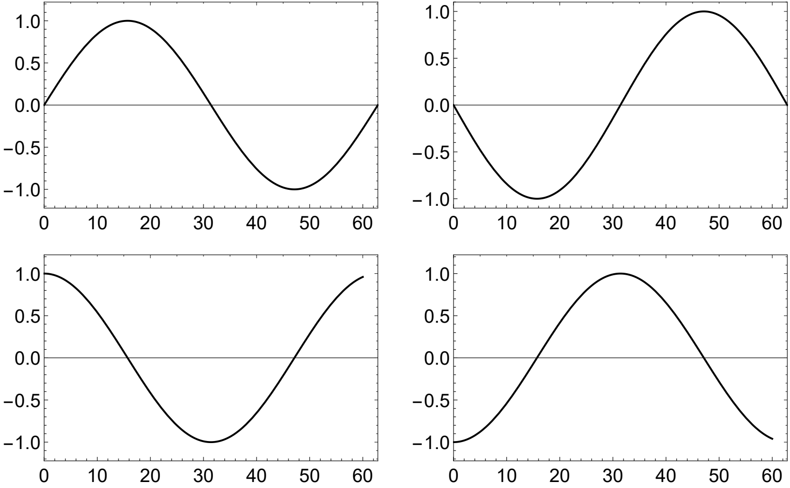

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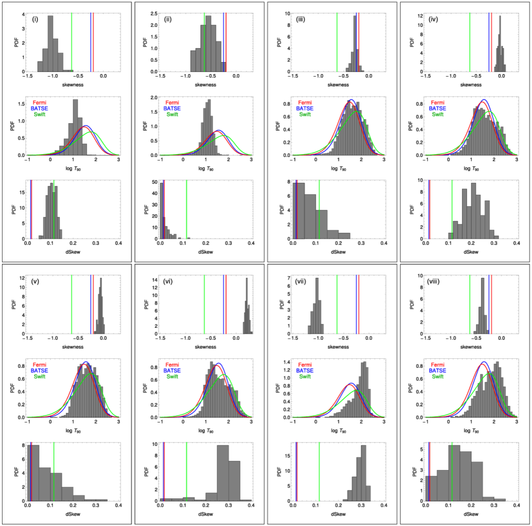


https://doi.org/10.1093/mnras/stab2232

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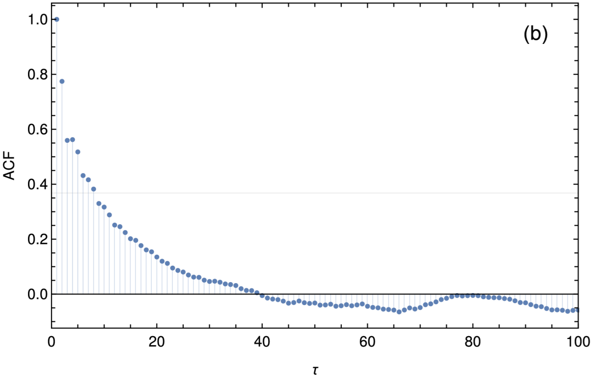


https://doi.org/10.1093/mnras/stab146

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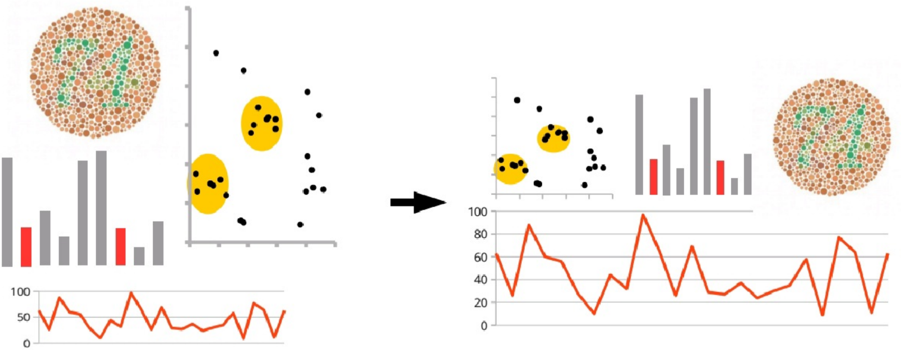

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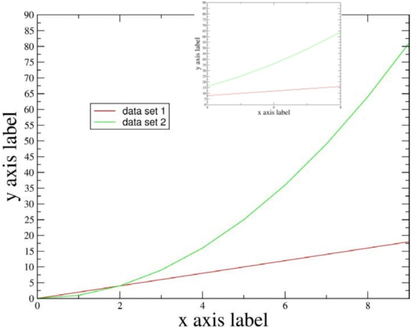

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data set 2
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x axis label
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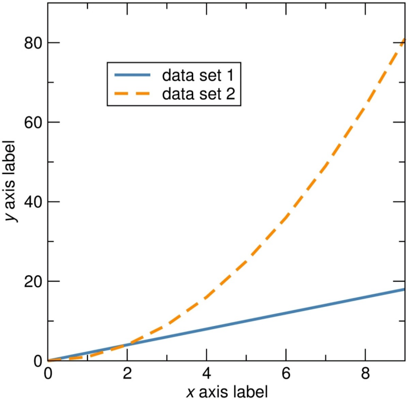

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y axis label
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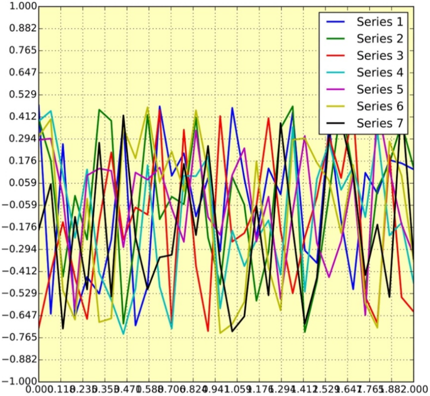

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−0.059
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−0.412
−0.529
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0.000
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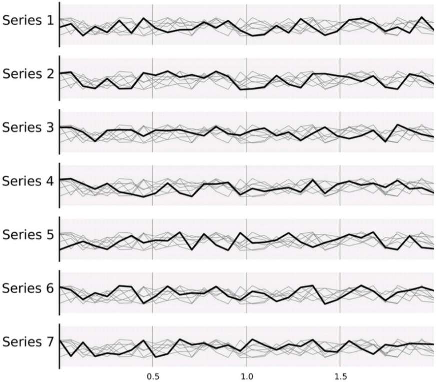
Series 1
Series 2
Series 3
Series 4
Series 5
Series 6
Series 7

Series 1
Series 2
Series 3
Series 4
Series 5
Series 6
Series 7
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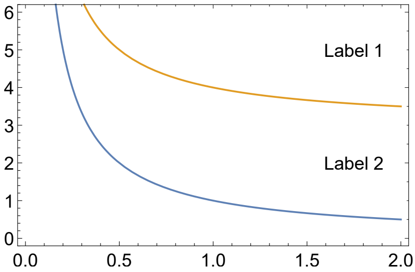

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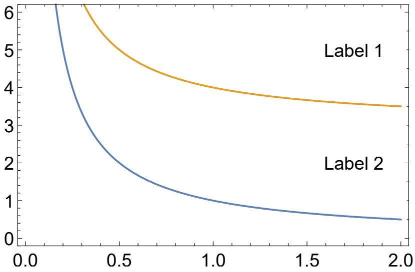


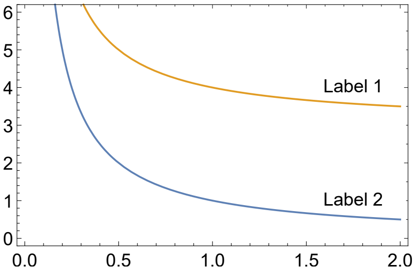

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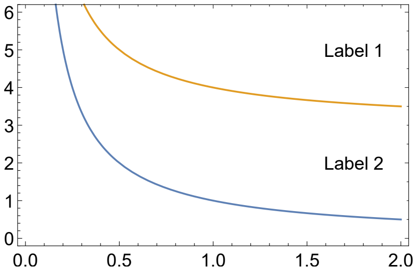
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Label 1
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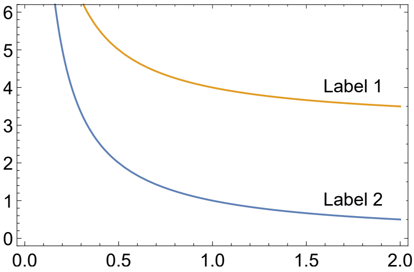
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Label 1
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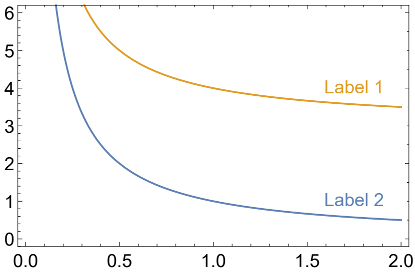
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Label 1
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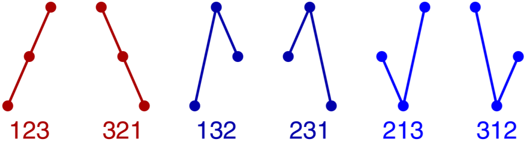


FIG. 1. Order patterns for three points.

https://doi.org/10.1103/PhysRevE.100.062144

# Kształt

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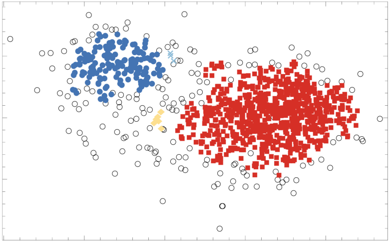
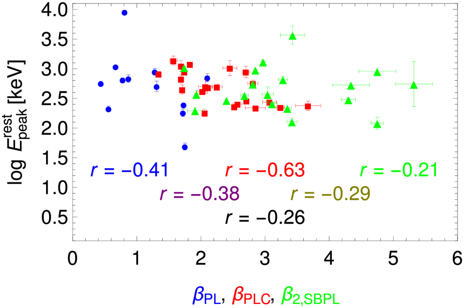
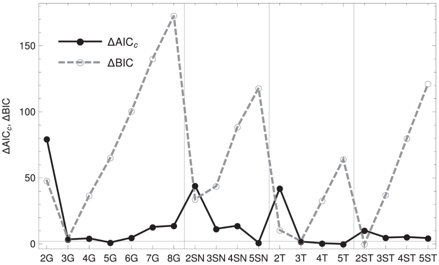


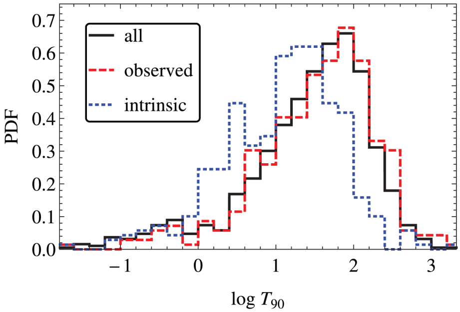



https://doi.org/10.1051/0004-6361/202038645;
https://doi.org/10.3847/1538-4357/abe5b1

# Kształt

## na wykresie

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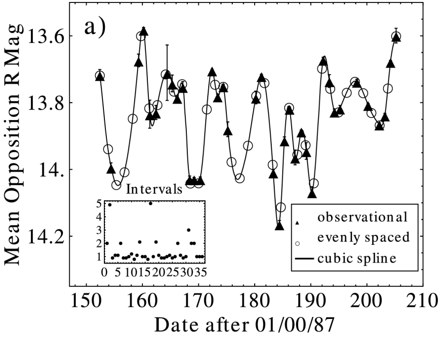
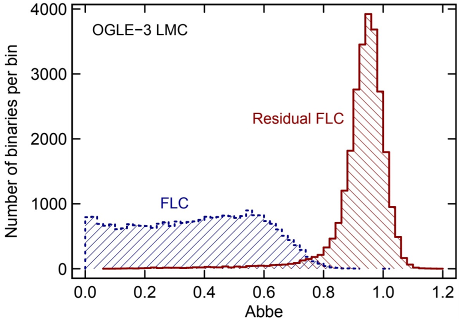
https://doi.org/10.3847/1538-4357/ab4fe6;
https://doi.org/10.1016/j.newast.2015.12.006

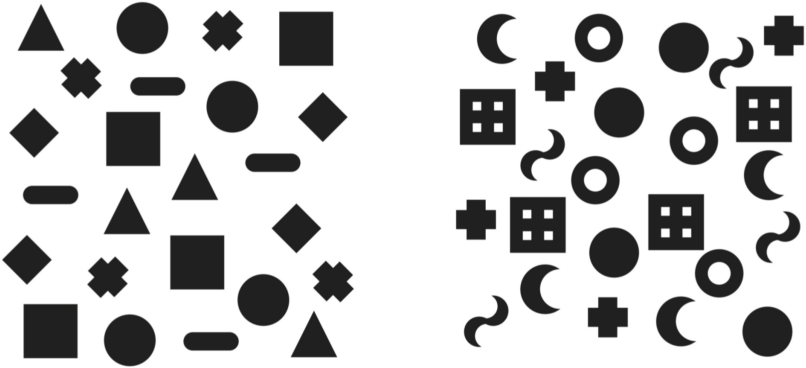



https://doi.org/10.1051/0004-6361/201730613

# Kształt

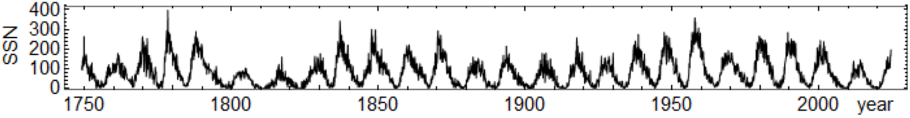
## na wykresie

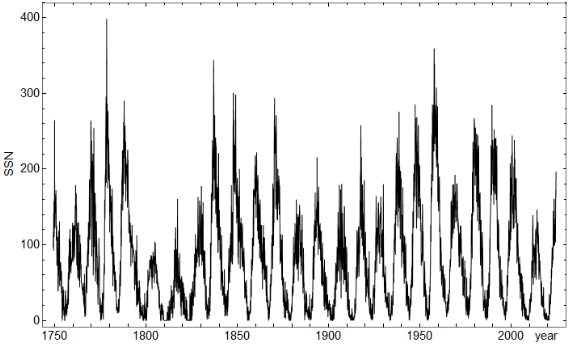


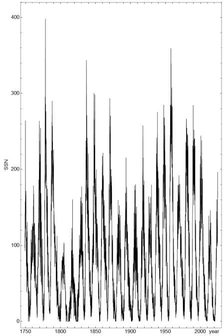
https://doi.org/10.1167/jov.20.4.10; https://doi.org/10.1177/15291006211051956

# Kształt

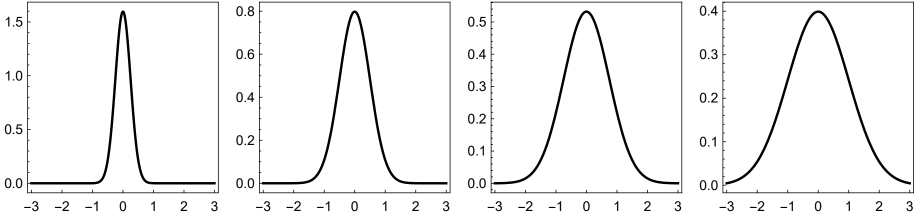
## wykresu



# Przestrzeń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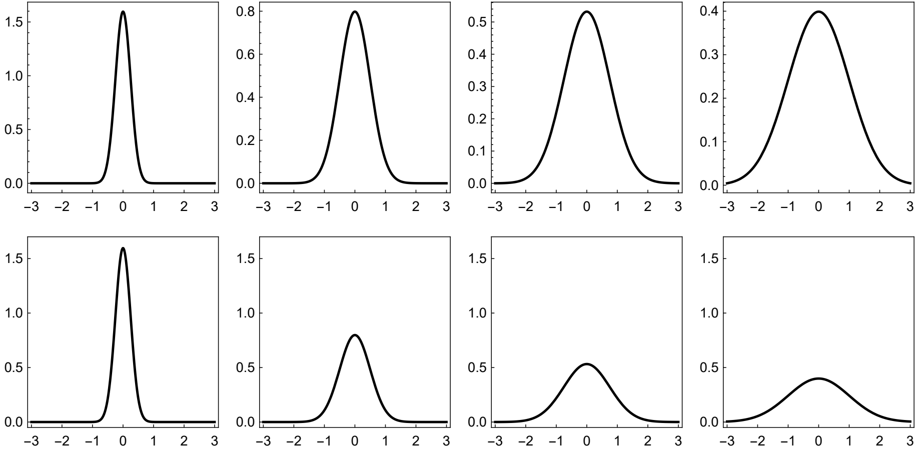
# Przestrzeń



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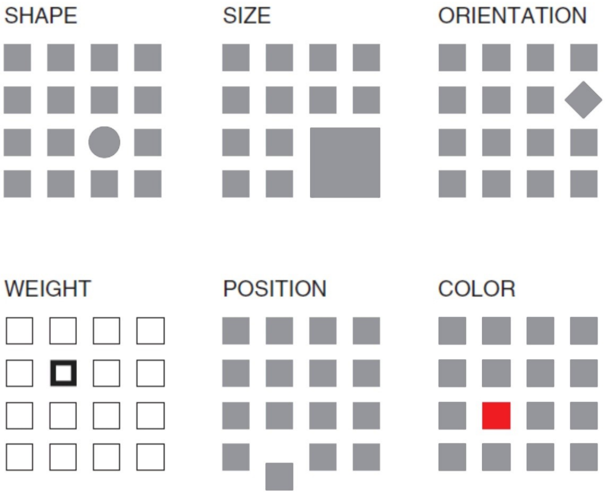

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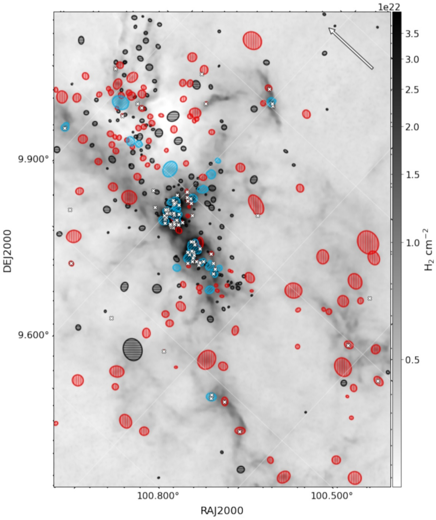
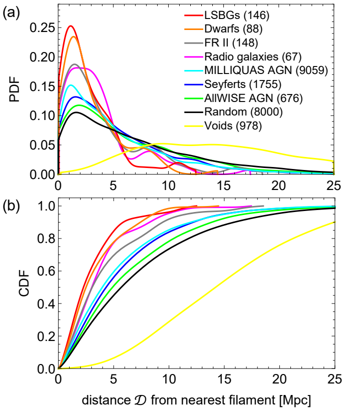



https://doi.org/10.1051/0004-6361/202243275

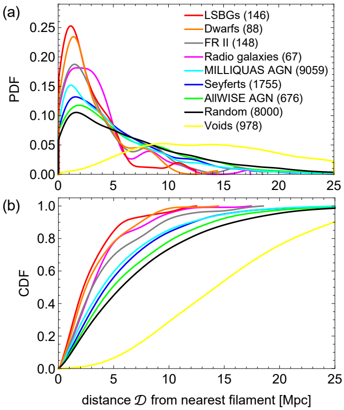
# Powtórzenie




⋮

https://doi.org/10.3847/1538-4357/acd9a4

# Powtórzenie

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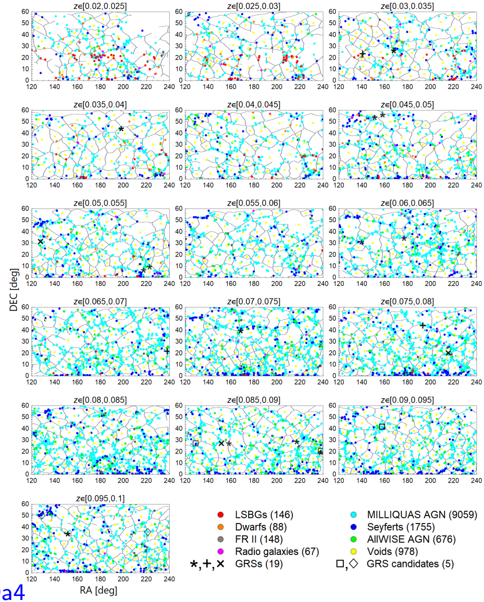



https://doi.org/10.3847/1538-4357/acd9a4

# Powtórzenie

**Table 1.** Parameters of the fits to the *Fermi* data. Label corresponds to labels from Fig. 2. The smallest AIC is marked in bold, and $p$ is the number of parameters in a model.

| Label | Dist. | $i$ | $\mu_i$ | $\sigma_i$ | $\alpha_i$ | $\delta_i$ | $\beta_i$ | $A_i$ | $\mathcal{L}_{\max}$ | AIC | ΔAIC | $Pr$ | $p$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (a) | 2-G | 1 | −0.073 | 0.525 | – | – | – | 0.215 | −1711.342 | 3432.683 | 4.459 | 0.108 | 5 |
| | | 2 | 1.451 | 0.463 | – | – | – | 0.785 | | | | | |
| (b) | 3-G | 1 | −0.409 | 0.379 | – | – | – | 0.107 | −1707.672 | 3431.343 | 3.119 | 0.210 | 8 |
| | | 2 | 0.668 | 0.570 | – | – | – | 0.231 | | | | | |
| | | 3 | 1.530 | 0.426 | – | – | – | 0.662 | | | | | |
| (c) | 2-SN | 1 | −0.735 | 0.954 | 2.819 | – | – | 0.208 | −1707.112 | **3428.224** | 0 | 1 | 7 |
| | | 2 | 1.865 | 0.664 | −1.507 | – | – | 0.792 | | | | | |
| (d) | 3-SN | 1 | −0.415 | 0.379 | 0.019 | – | – | 0.107 | −1707.672 | 3437.343 | 9.119 | 0.010 | 11 |
| | | 2 | 0.726 | 0.573 | −0.127 | – | – | 0.231 | | | | | |
| | | 3 | 1.515 | 0.426 | 0.044 | – | – | 0.662 | | | | | |
| (e) | 2-SAS | 1 | 1.537 | 0.468 | – | −0.014 | 1.068 | 0.685 | −1706.089 | 3430.177 | 1.953 | 0.377 | 9 |
| | | 2 | 2.158 | 6.146 | – | −2.367 | 7.756 | 0.315 | | | | | |
| (f) | 3-SAS | 1 | 0.434 | 1.063 | – | 0.370 | 2.111 | 0.214 | −1704.248 | 3436.497 | 8.273 | 0.016 | 14 |
| | | 2 | 0.473 | 0.402 | – | −4.161 | 2.680 | 0.111 | | | | | |
| | | 3 | 1.529 | 0.468 | – | 0.020 | 1.087 | 0.675 | | | | | |
| (g) | 1-ASN | 1 | 0.744 | 0.590 | −1.712 | – | – | 1 | −1725.038 | 3456.077 | 27.853 | $<10^{-6}$ | 3 |
| (h) | 2-ASN | 1 | 0.087 | 0.499 | 0.535 | – | – | 0.186 | −1710.427 | 3434.853 | 6.629 | 0.036 | 7 |
| | | 2 | 1.150 | 0.483 | −0.667 | – | – | 0.814 | | | | | |

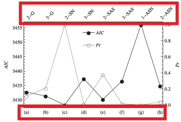



**Figure 3.** AIC and relative probability ($Pr$) for the *Fermi* models.

*3.2.2 BATSE and Swift*

The results are slightly different for the BATSE and *Swift* data sets, and are displayed in graphical form in Figs 4 and 5. Here, instead of fitting a 1-ASN and a 2-ASN, a 2-ASN and a 3-ASN distributions are fitted, because the 1-ASN yielded an AIC so large that a comparison with other models would be uninsightful.[7] For both samples, the minimal AIC is obtained for a mixture of three standard Gaussians, hence the results of all the previous analyses are confirmed (Horváth 2002; Horváth et al. 2008; Zhang & Choi 2008; Horváth 2009; Huja & Řípa 2009; Huja et al. 2009; Zitouni et al. 2015). However, for the second best models (2-SAS and 2-SN for BATSE and *Swift*, respectively), the ΔAIC is ≈1, corresponding to a relative probability of 57.9 per cent and 63.2 per cent for BATSE and *Swift*, respectively (see Tables 2 and 3). This is a substantial

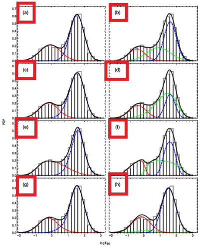
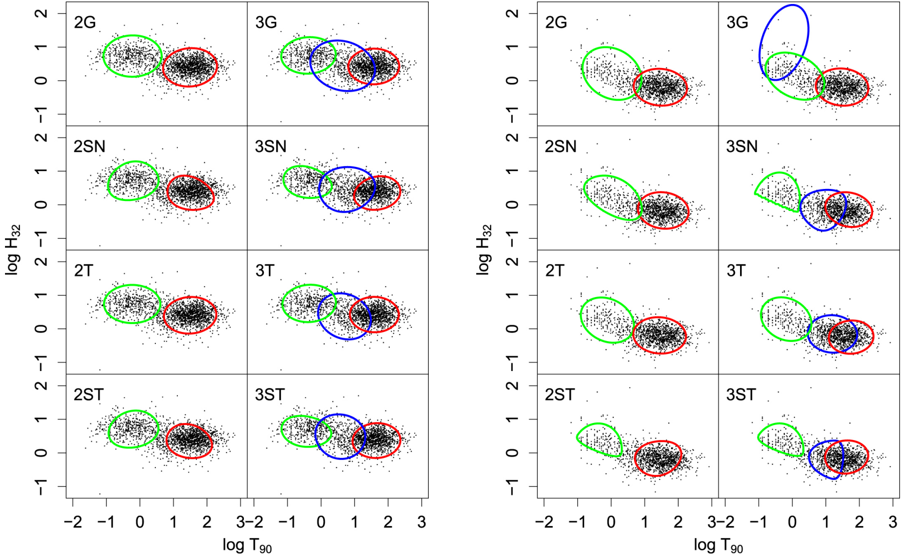



**Figure 4.** Distributions fitted to log $T_{90}$ data from the BATSE current catalogue. Colour dashed curves are the components of the (black solid) mixture distribution. The panels show a mixture of (a) two standard Gaussians, (b) three standard Gaussians, (c) 2-SN, (d) 3-SN, (e) 2-SAS, (f) 3-SAS, (g) 2-ASN, and (h) 3-ASN distributions.

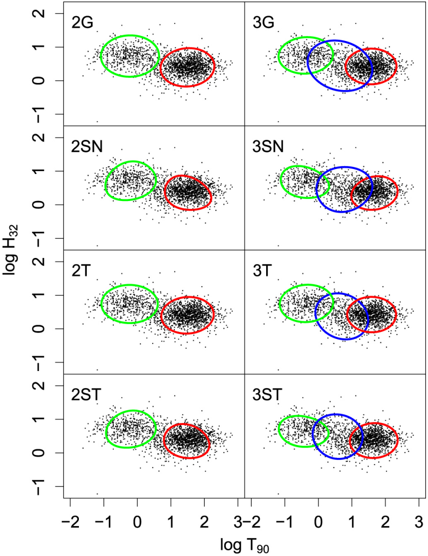
https://doi.org/10.3847/1538-4357/aaf1c5

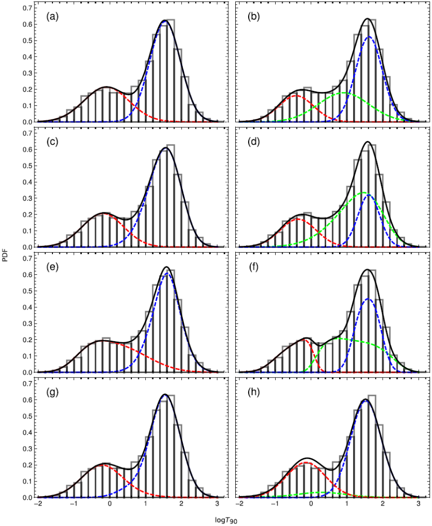
# Powtórzenie ✓




https://doi.org/10.3847/1538-4357/aaf1c5

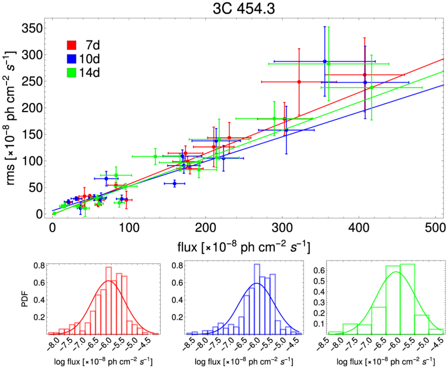
# Powtórzenie $X$

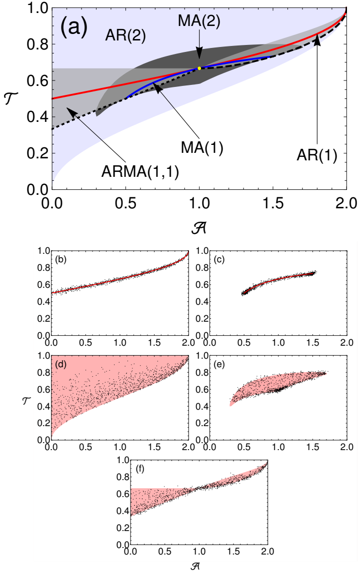


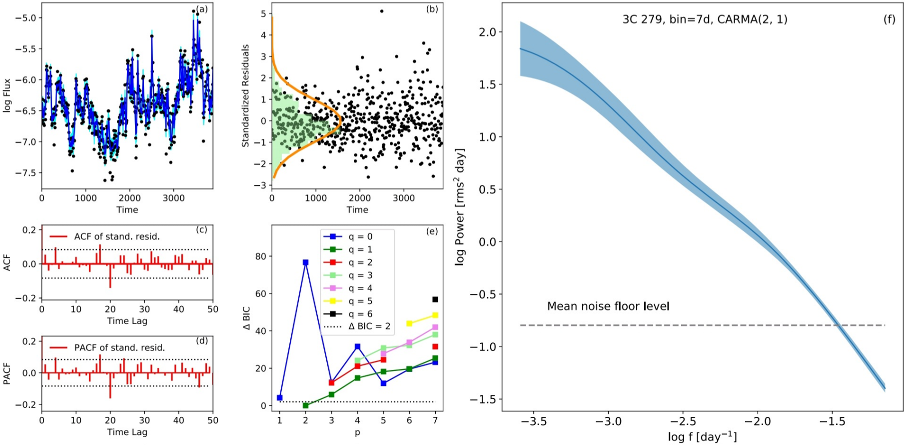

https://doi.org/10.3847/1538-4357/aaf1c5; https://doi.org/10.1093/mnras/stw429

# Skala



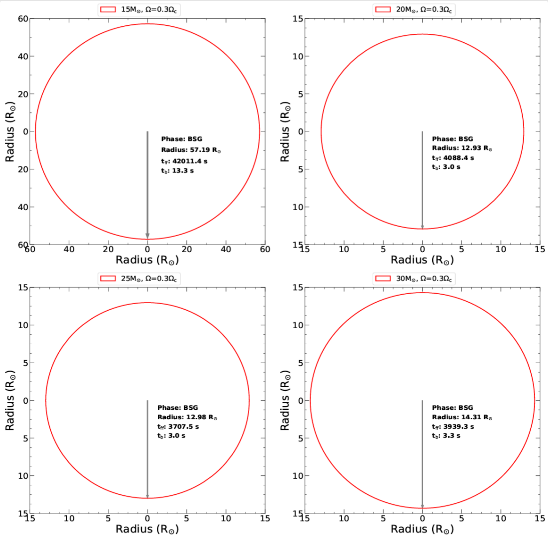




https://doi.org/10.3847/1538-4365/aba2c7;
https://doi.org/10.1103/PhysRevE.100.062144



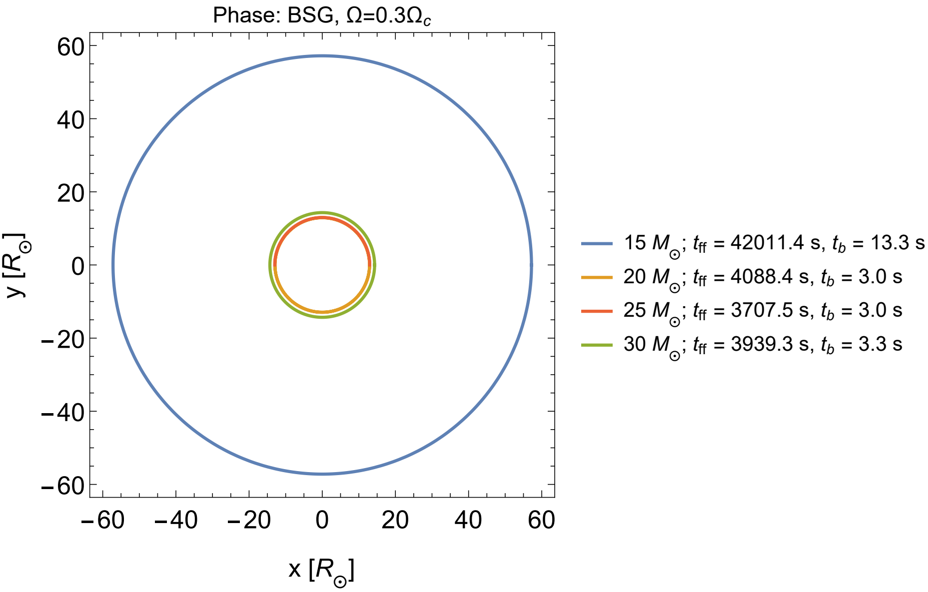

https://doi.org/10.3847/1538-4365/aba2c7

# Skala $X$



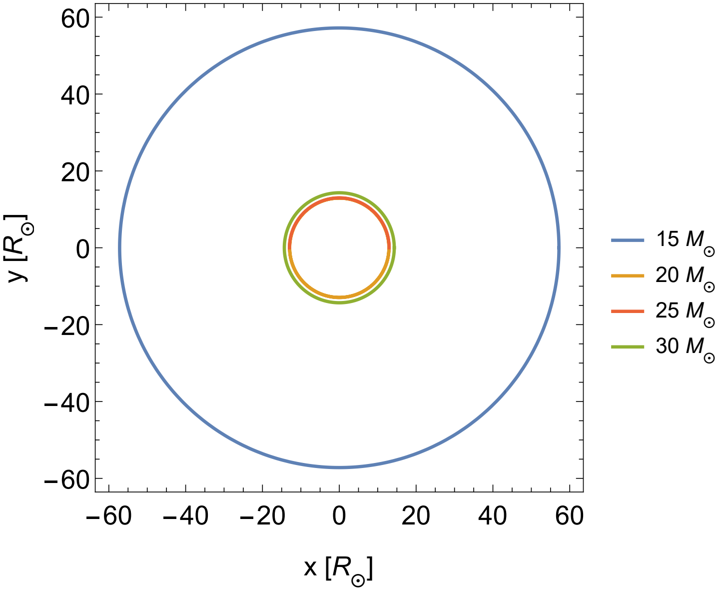

https://doi.org/10.3847/1538-4357/ad5554

# Skala ✓



Phase: BSG, Ω=0.3Ω_c
60
40
20
0
−20
−40
−60
y [R_⊙]
x [R_⊙]
15 M_⊙; t_ff = 42011.4 s, t_b = 13.3 s
20 M_⊙; t_ff = 4088.4 s, t_b = 3.0 s
25 M_⊙; t_ff = 3707.5 s, t_b = 3.0 s
30 M_⊙; t_ff = 3939.3 s, t_b = 3.3 s

# Skala ✓✓



60
40
20
0
−20
−40
−60
y [$R_\odot$]
−60
−40
−20
0
20
40
60
x [$R_\odot$]
15 $M_\odot$
20 $M_\odot$
25 $M_\odot$
30 $M_\odot$

# Hierarchia

Hierarchia ułatwia dostrzeżenie na wykresie tego co najistotniejsze. Tzn. elementy najważniejsze powinny najbardziej rzucać się w oczy.

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- Hierarchia typografii — np. wielkość czcionki w nagłówkach tekstu; wielkość etykiet na wykresie itp.
- Elementy graficzne — powiązanie z wyróżnieniem (slajd 6), kontrastem (slajd 25) i skalą (slajd 31), ale też balansem (slajd 4), kompozycją (slajd 16) i kształtem (slajd 19).

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