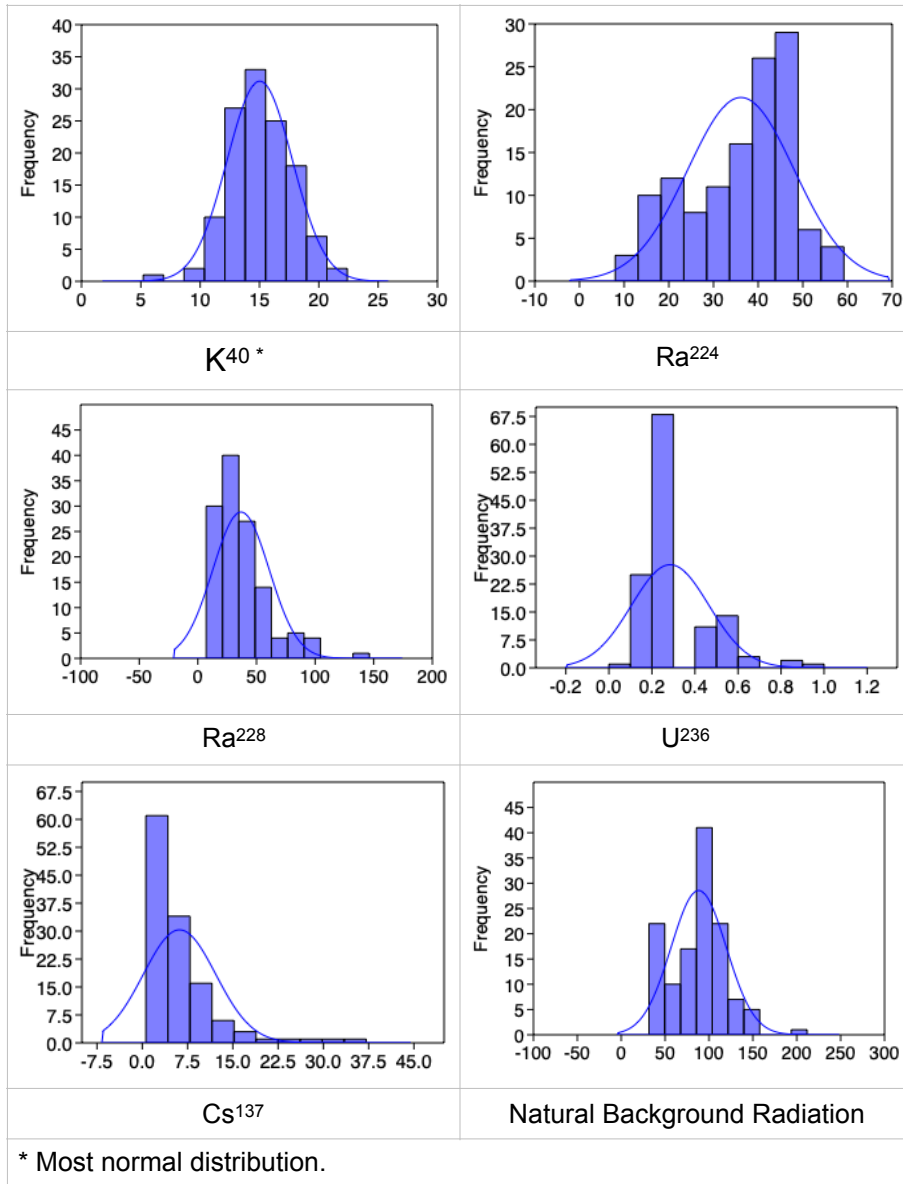
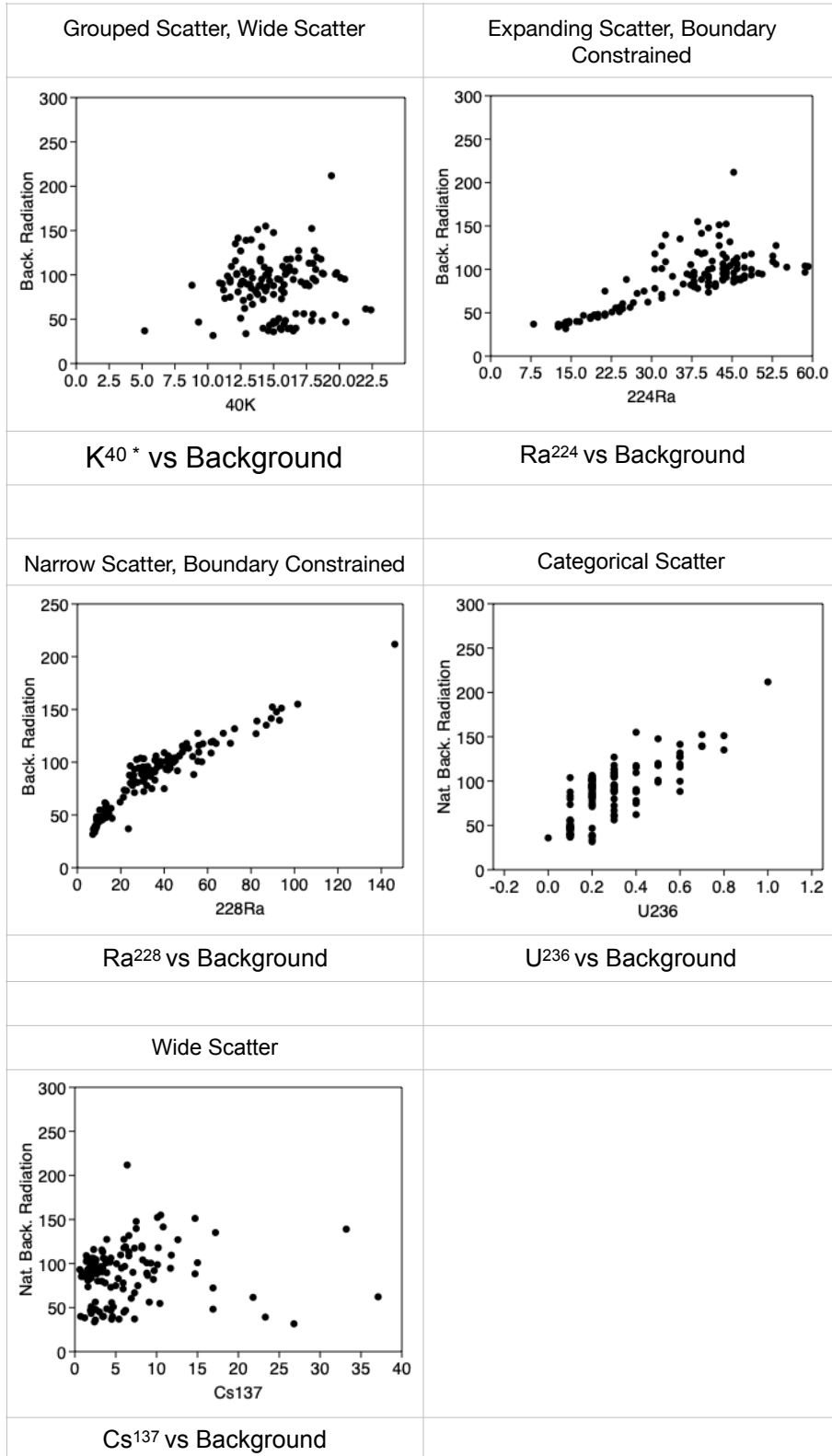


## Lab 1 Assignment

- Download PAST and the PAST User's Manual from the PAST website and install the software on your personal computer. (10 points)
- Open the Croatia Radiation Data.dat datafile in the PAST program. Generate the following descriptive statistical plots.
  - Create 10-bin histograms for the following variables: K40, Ra224, Ra228, U236, Cs137, Natural Background Radiation. (70 points)
    - Identify the variable whose distribution most closely resembles a normal distribution.

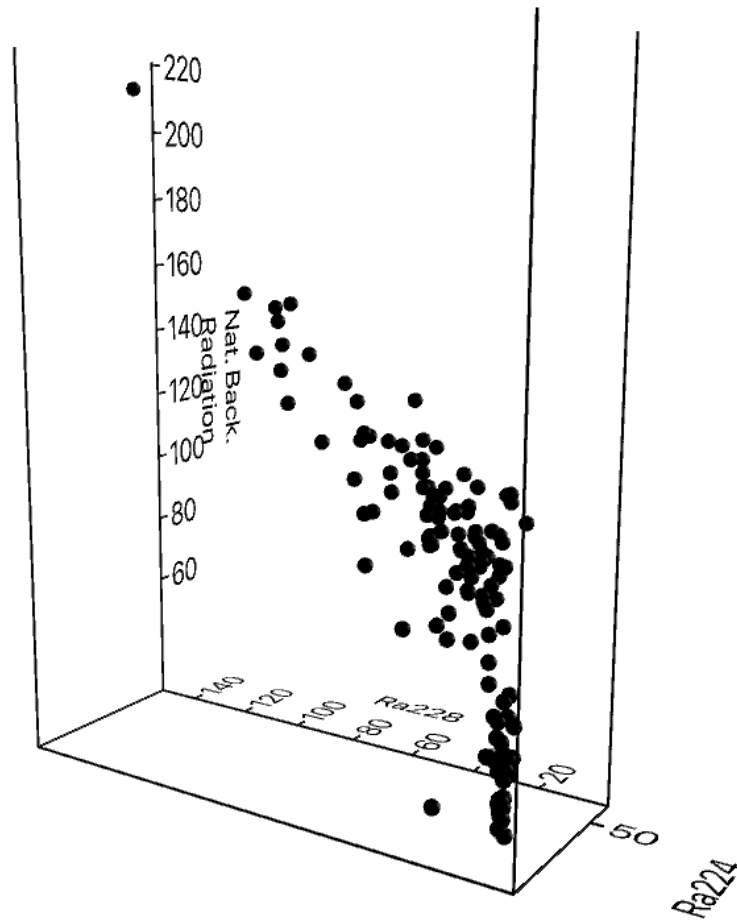


- Create scatterplots for the following variable pairs:
  - K40-Background
  - Ra224-Background,
  - Rc228-Background,
  - U236-Background,
  - Cs137-Background. (50 points)
- Identify which distributions exhibit the following forms: wide scatter, narrow scatter, boundary-constrained scatter, categorical. (50 points)



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- Create a 3D scatterplot of the radon isotopic variable vs background radiation (10 points) and describe their geometric relationship. (30 points)



- Values appear to fall on the surface of a plane oriented at a high angle to all three variables axes, suggesting a close correlation between these sources of radiation.
- Two outliers are present one of which (77) exhibits unusually high  $Ra^{228}$  and Natural Background values and the other of which (37) exhibits and unusually low  $Ra^{224}$  value.
- In addition, the variance of the series increases dramatically above c. a natural background variation level of 70 and then drifts down to lower values as the values of all three variables increase..

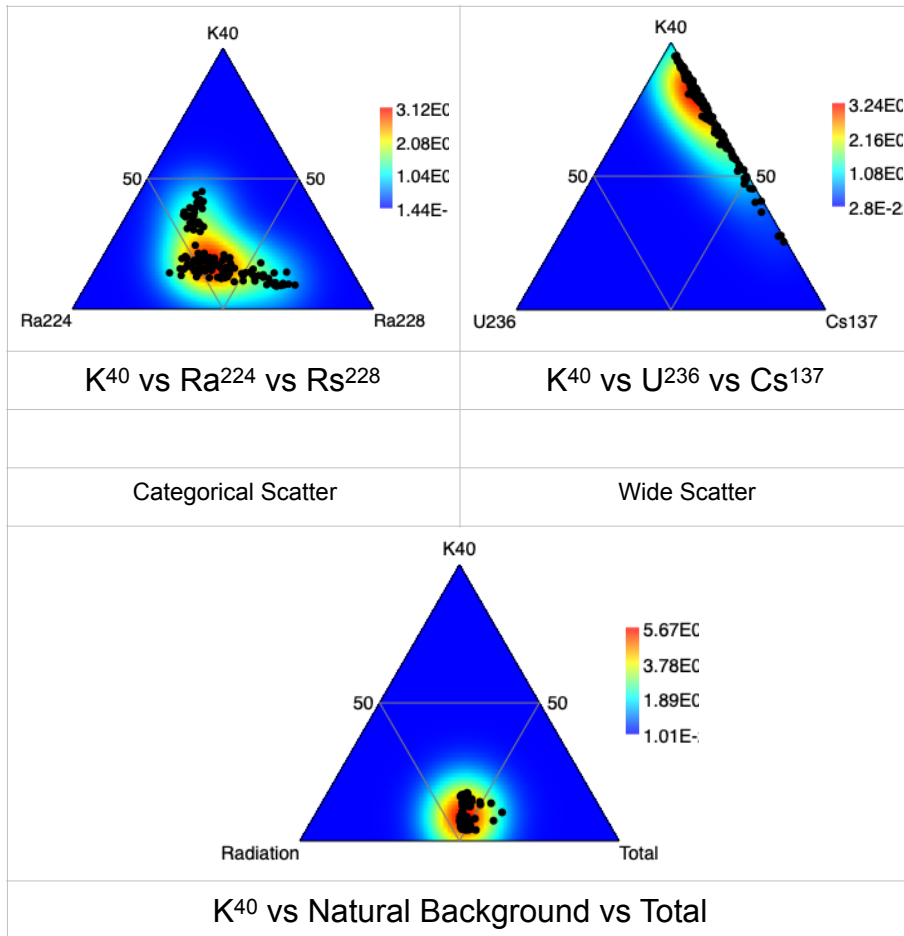
3. For each variable, list or calculate the following parameters and present these summaries in the form of a table.
- No. of observations, maximum value, arithmetic mean, geometric mean, median, minimum values, range of observations, variance, standard deviation, coefficient of variation. (20 points)

	$K^{40}$	$Ra^{224}$	$Ra^{228}$	$U^{236}$	$Cs^{137}$	Nat. Back. Radiation	Total
<b>N</b>	125.000	125.000	125.000	125.000	125.000	125.000	125.000
<b>Maximum</b>	22.400	59.200	146.200	1.000	37.100	211.800	218.200
<b>Mean</b>	15.022	36.142	36.802	0.285	6.178	88.252	94.418
<b>Geom. mean</b>	14.753	33.652	29.582	0.000	4.391	82.193	88.592
<b>Median</b>	15.000	39.300	31.500	0.200	4.400	90.800	96.000
<b>Minimum</b>	5.200	8.000	7.100	0.000	0.600	31.600	36.000
<b>Range</b>	17.200	51.200	139.100	1.000	36.500	180.200	182.200
<b>Variance</b>	7.564	142.144	579.139	0.032	35.994	990.199	1054.327
<b>Stand. dev</b>	2.750	11.922	24.065	0.180	6.000	31.467	32.470
<b>Coeff. var</b>	18.308	32.988	65.392	63.230	97.118	35.656	34.390

- Using the table you created above, answer the following questions. (70 points)
  - Variable with the greatest range? **Background Radiation (Total)**
  - Variable with the smallest range?  **$U^{236}$**
  - Variable with the greatest difference between its arithmetic and geometric mean?  **$Ra^{238}$**
  - Variable with the greatest variance? **Background Radiation (Total)**
  - Variable with the least variance?  **$U^{236}$**
  - Variable with the greatest variability?  **$Cs^{137}$**
  - Variable with the least variability?  **$K^{40}$**

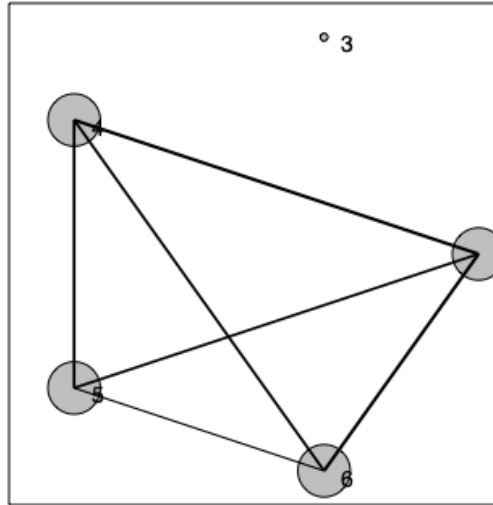
4. Create a ternary density plot of the following variable triplets: (30 points)

- K40-Ra224-Ra228
- K40-U236-Cs137
- K40-Background-Total



- Using the plots you created above, identify the triplet that contains evidence of data clustering. (10 points)  
[K<sup>40</sup>-Ra<sup>224</sup>-Ra<sup>228</sup>](#)

5. Use a network plot of the first five observations for the following variables to identify the least typical observation: K40, Ra224, Ra228, U236, Cs137 (10 points)



6. Based on the plot you created above, along with the data table, explain how the observation you identified is unusual. (40 points)

Unusually high concentration of Ra<sup>224</sup>, Ra<sup>228</sup> along with a marginally high concentration of Cs<sup>137</sup>.