Q1.

I want to model the relation between vegetation height and snow depth which may contain land elevation and then use terrestrial laser scanner data for accuracy assessment. Therefore, uncertainty and sensitivity analyses, parameter estimation and models for reporting the accuracy of the results are on top of my interest. I couldn't find anything related to my research in Stan forum, but, I found `stan_jm` in Stan for joint longitudinal and time-to-event model. This actually gave me the idea of joining different and separate spatial datasets and have unique time series of change.

Q2.

"We are faced here with several possibilities and can follow one path or another. But we can wonder what would have happened if we'd chosen the other option", (from the story). In Garden of forking paths you have all possible options and you can consider all possible combinations (like the marbles' example in the course material). Also, your prior decision or choice affects the future result. Among all possibilities you can choose the one that accomplish your hypothesis. In other words, it's related to statistical significance testing. It means as you want to have statistically significant results you test all possible factors that might affect your hypothesis and then choose the one which gives the P-value lower than significance level (P-hacking). I think having multiple ways to approach a hypothesis and look at the test and of course P-hacking are the main reasons people in statistics speak about garden of forking paths.

Q3.

$P(Earth) = P(Mars) = 0.5$

$P(Land|Earth) = 0.3$

$P(Water|Earth) = 0.7$

$P(Land|Mars) = 1$

$P(Land) = \frac{100 + 30}{200} = \frac{13}{20}$

$P(Earth|Land) = \frac{P(Land|Earth) \times P(Earth)}{P(Land)} = \frac{0.3 \times 0.5}{\frac{13}{20}} = 0.23$

Q4.

$$P(twins \mid A) = 0.1\,, \quad P(singleton \mid A) = 0.9, \quad P(A) = 0.5$$

$$P(twins \mid B) = 0.2, \quad P(singleton \mid B) = 0.8, \quad P(B) = 0.5$$

$$the\ probability\ that\ the\ first\ birth\ was\ twins\ and\ the\ second\ was\ also\ twins\ equals:$$

$$\frac{3}{20} \times \frac{3}{20} = 0.0225$$

A)

$$P(twins) = \frac{1+2}{20} = \frac{3}{20}$$

$$P(A \mid twins) = \frac{P(twins \mid A) \times P(A)}{P(twins)} = \frac{0.1 \times 0.5}{\frac{3}{20}} = 0.33$$

B)

$$P(singleton) = 1 - P(twins) = 1 - \frac{3}{20} = \frac{17}{20}$$

$$P(A \mid singleton) = \frac{P(Singleton \mid A) \times P(A)}{P(singleton)} = \frac{0.9 \times 0.5}{\frac{17}{20}} \approx 0.59$$

$$P(A \mid first\ twin, second\ singleton) = \frac{P(\ first\ twin, second\ singleton \mid A) \times P(A)}{P(first\ twin, second\ singleton)}$$
$$= \frac{(0.1 * 0.9) \times 0.5}{\frac{3}{20} \times \frac{17}{20}} = 0.35$$

C)

a)

$$P(correct \mid A) = 0.8, \quad P(correct \mid B) = 0.65$$

$$P(correct) = \frac{8+6.5}{20} = \frac{14.5}{20}$$

$$P(A \mid correct) = \frac{P(correct \mid A) \times P(A)}{P(correct)} = \frac{0.8 \times 0.5}{\frac{14.5}{20}} = 0.55$$

b)

$$P(A \mid twins, correct) = \frac{P(twins, correct \mid A) \times P(A)}{P(twins, correct)} = \frac{(0.1 * 0.8) * 0.5}{\frac{3}{20} \times \frac{8+6.5}{20}} = 0.36$$