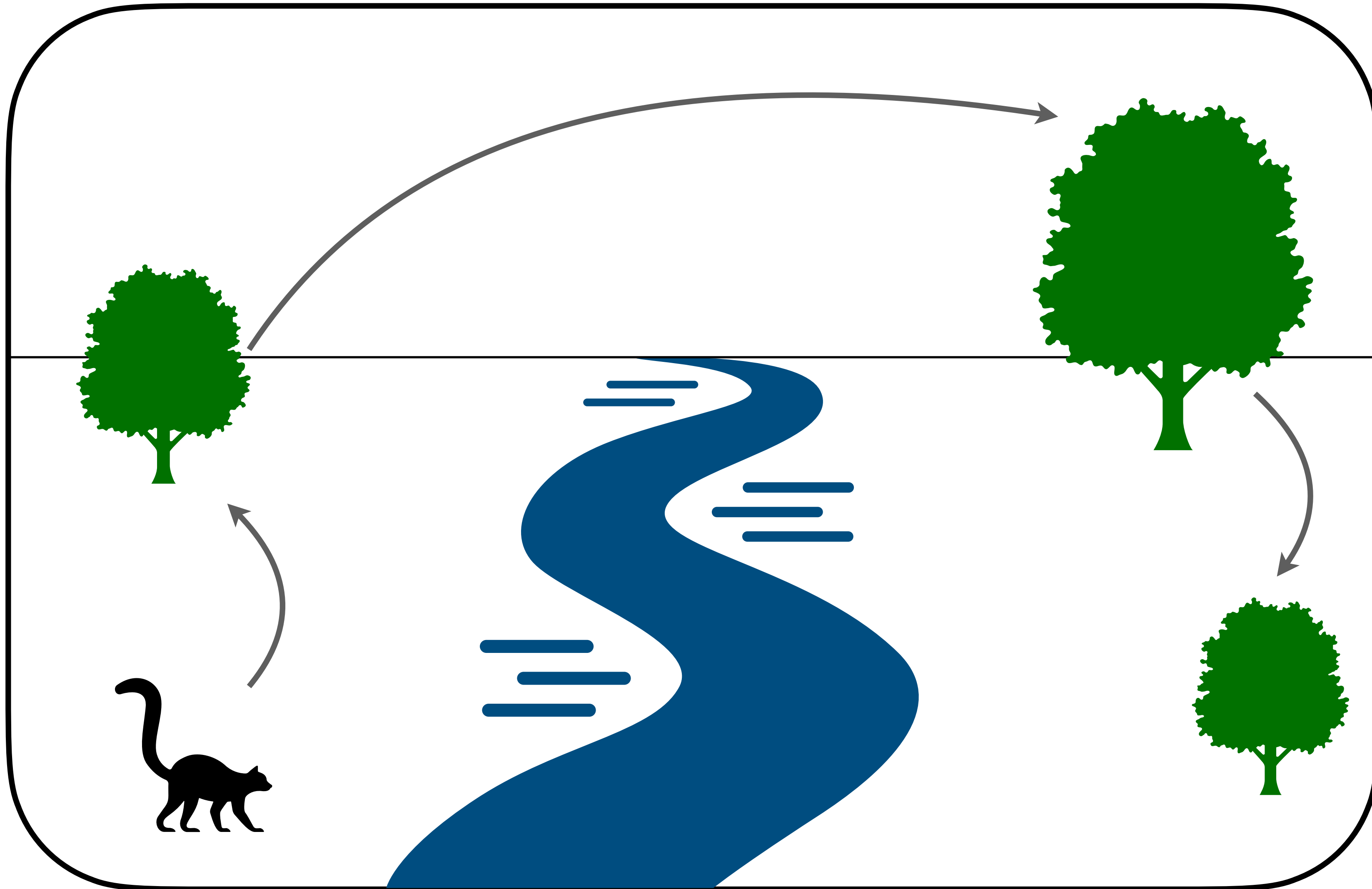


How can you optimally forage?

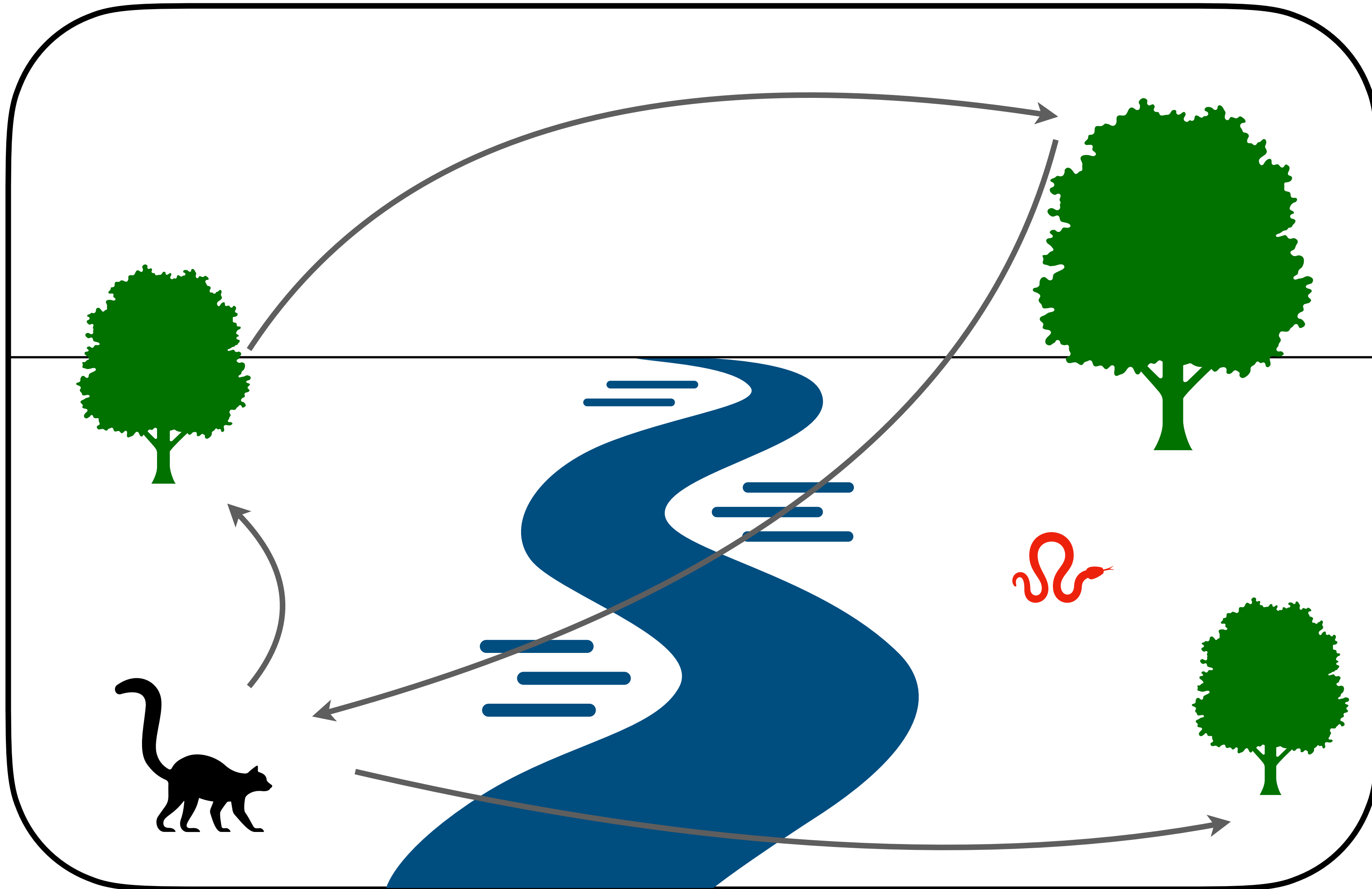
Readings for today

- Pirolli, P., & Card, S. (1999). Information foraging. *Psychological review*, 106(4), 643.

The foraging problem



The foraging problem



Foraging tasks

Resources

- **Tangible:** Physical resources whose value increased with each unit obtained (e.g., food, water, money).

OR

- **Informational:** Sensory experiences that change or affect internal memory states.

} Patches

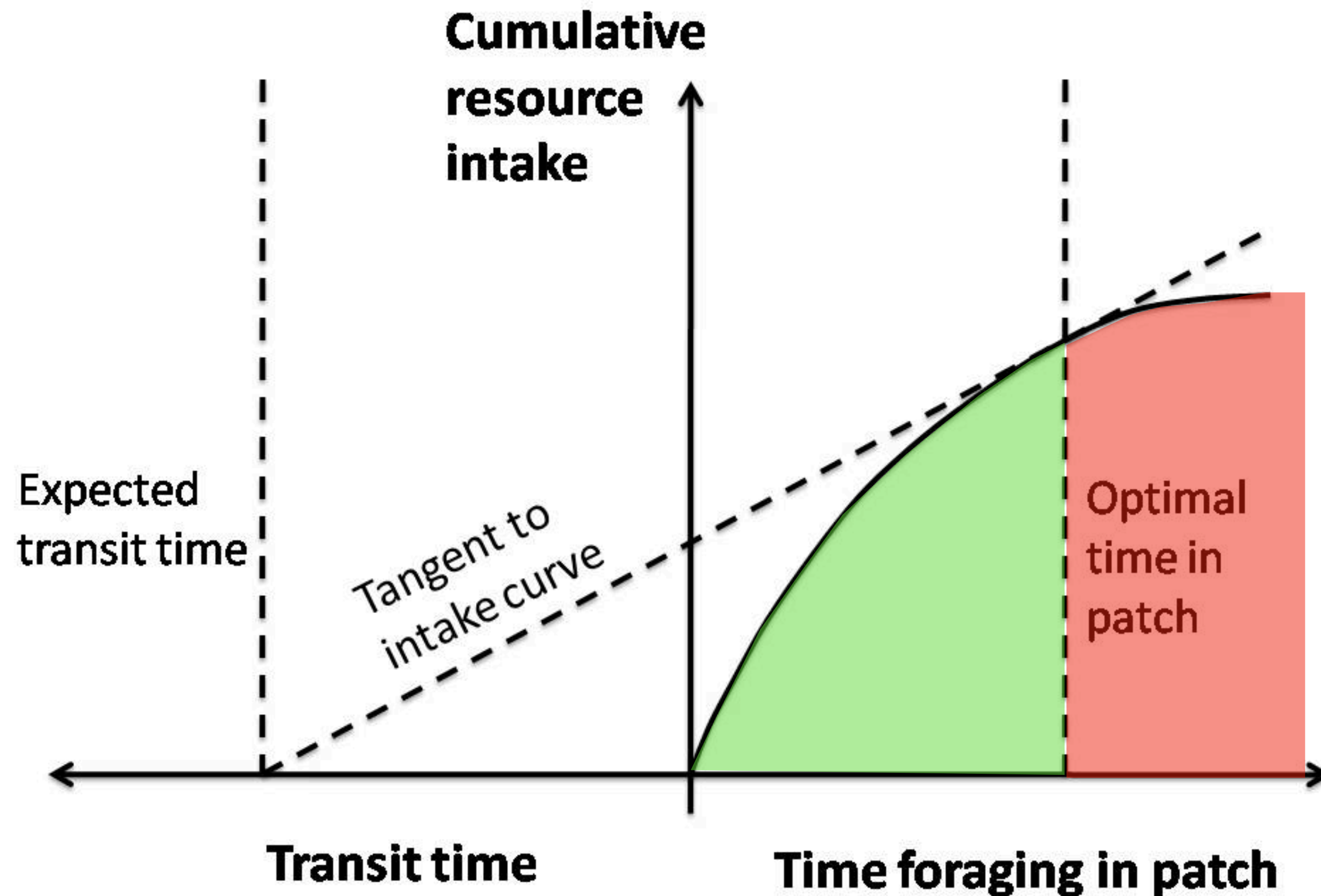
Costs

- **Resource costs:** Expenditures of calories, money, etc. that are incurred by the chosen activity.

AND

- **Opportunity costs:** Benefits that could be gained by engaging in other activities, but are forfeited by engaging in the chosen activity.

Marginal value theory



The optimal strategy for foraging is one that maximizes gain per unit time when resources, as well as rate of returns, decrease with time.

Information foraging theory

The application of MVT to situations requiring information gathering and sense making (i.e., allocation of attention), and where agents can mold the environment to fit available strategies (i.e. enrichment)

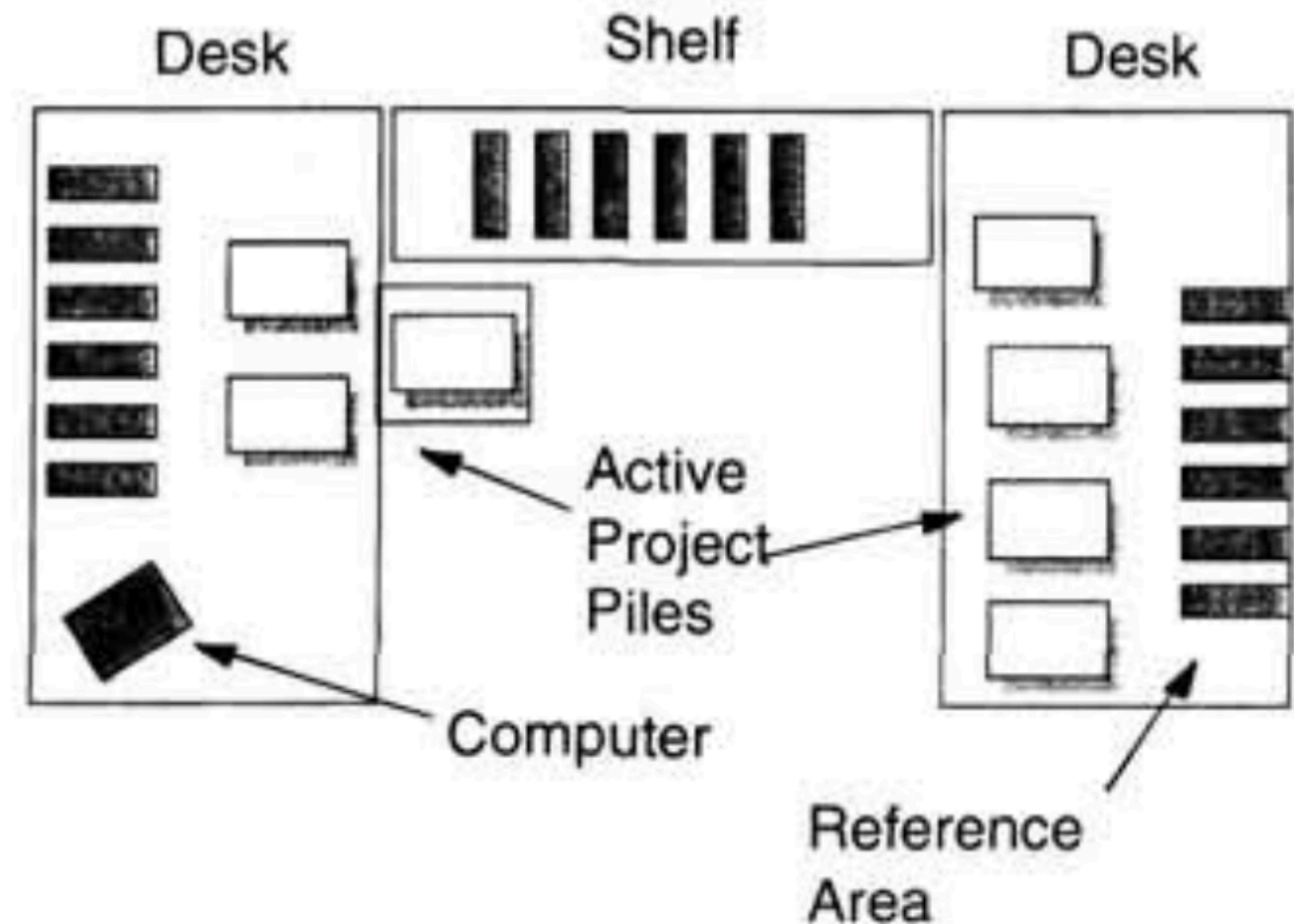
Rewards → Information

Physical effort → Attention

Information foraging example

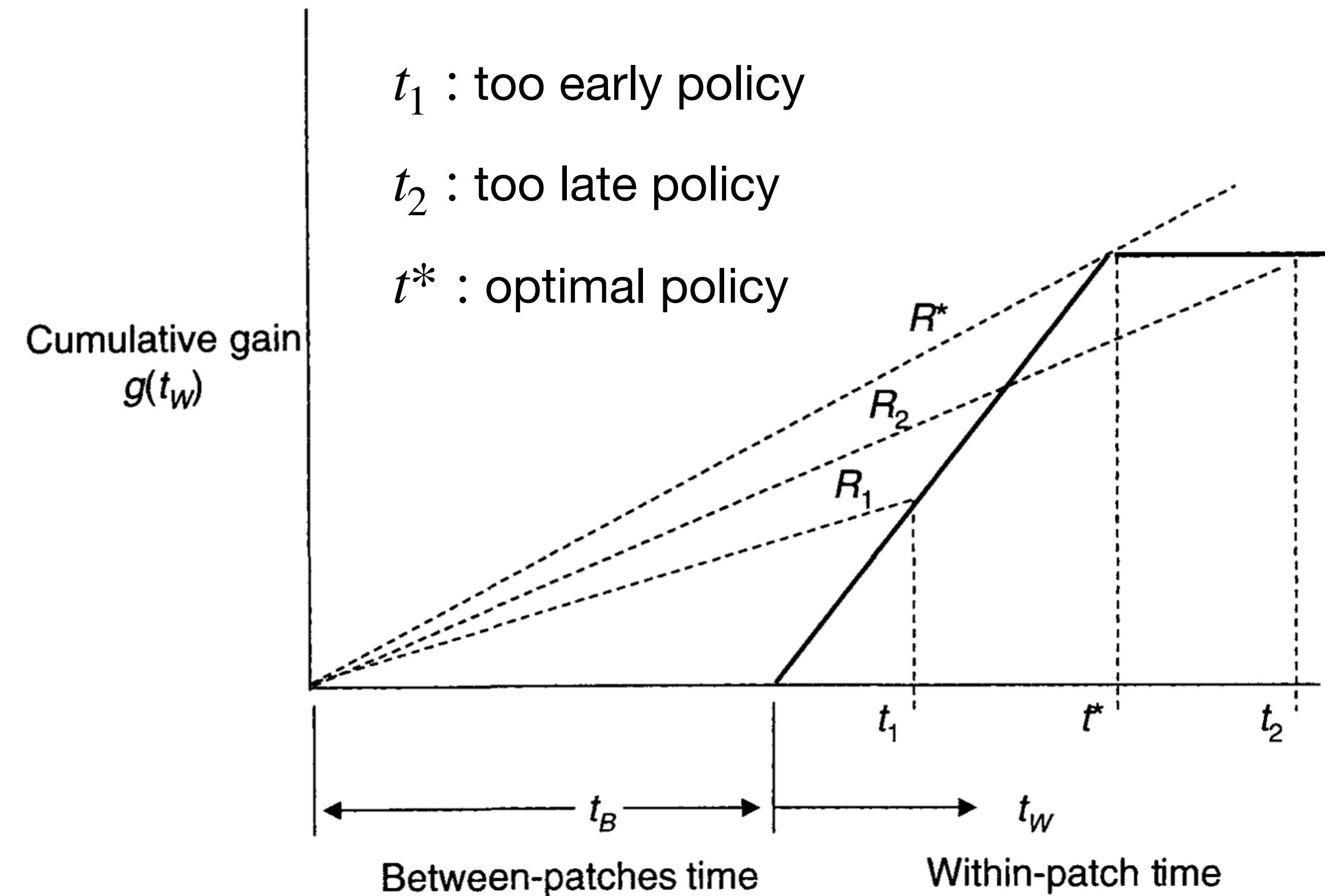
Resources

1. The arrangement of task-related information into physically localized clusters reduces the overall costs of accessing items when engaged in relevant tasks.
2. Clusters of task-related information seem to be arranged such that those with higher frequency of access are placed in areas that have lower costs of access.



How does the analyst move around from source to source when gathering information?

Information patch foraging



$$R = \frac{G}{T_B + T_W}$$

Resources gained G

Between patch effort (time) T_B

Within patch effort (time) T_W

Information patch foraging

The diagram illustrates the derivation of the Biologically Intelligent eXploration (BIX) equation from a basic foraging model. A horizontal arrow points from the left equation to the right equation.

Left Equation:

$$R = \frac{G}{T_B + T_W}$$

Annotations for the left equation:

- G : Resources gained
- T_B : Between patch effort (time)
- T_W : Within patch effort (time)

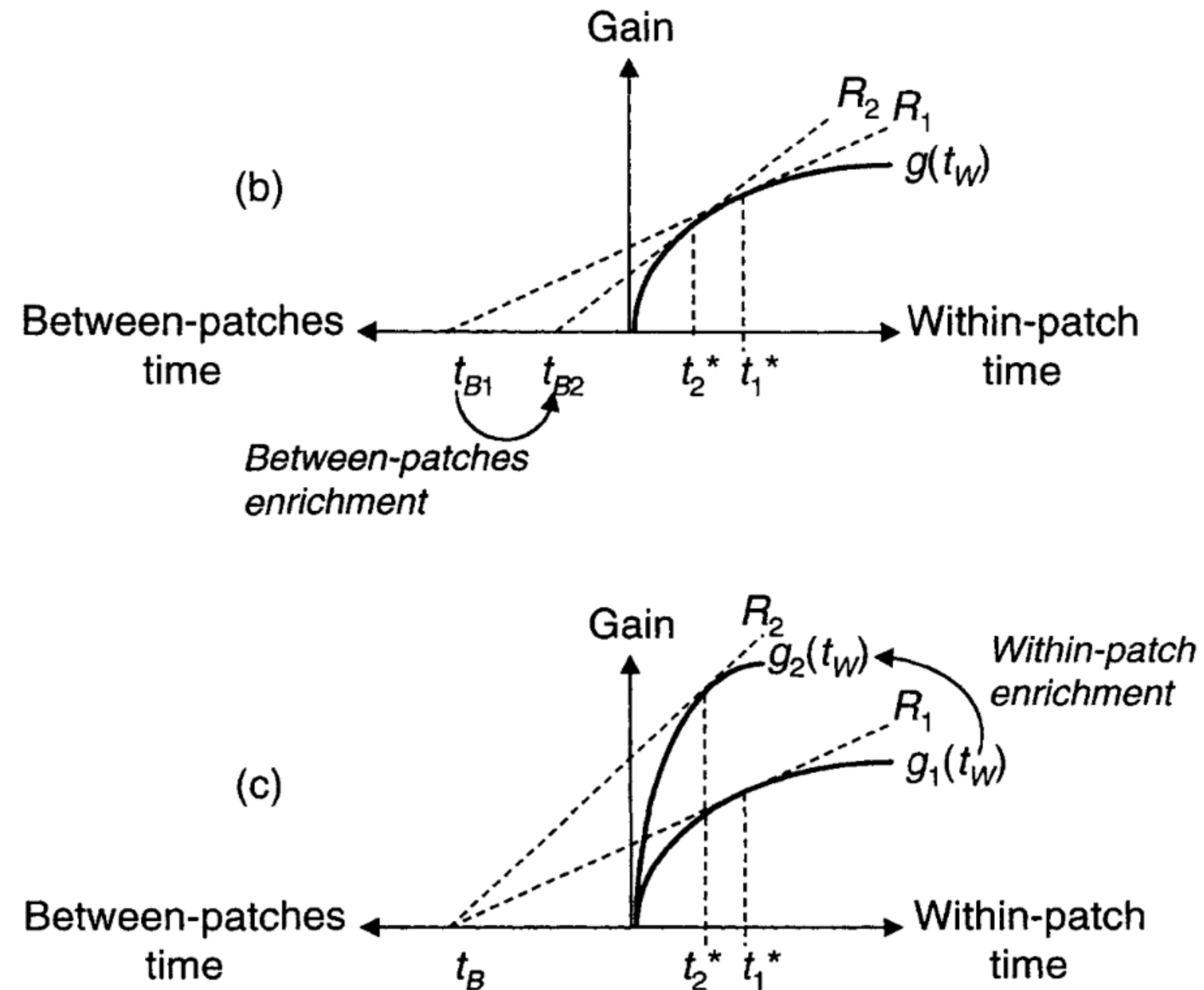
Right Equation:

$$R = \frac{\sum_{i=1}^P \lambda_i g_i(t_{Wi})}{1 + \sum_{i=1}^P \lambda_i t_{Wi}}$$

Annotations for the right equation:

- λ_i : Rate of encountering patch i
- $g_i(t_{Wi})$: Resources gained in patch i
- t_{Wi} : Time in patch i

What's special about information foraging?



Enrichment allows for a change in the gain rate or effort expenditures, modifying the optimal foraging patterns.

Food for thought

- Let's go foraging!