

AI consciousness: Can it be? Do we need it to be?

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<https://agirussia.org>

Questions?

What is the “consciousness” and its conceptual grid?

Is this definition needed to work on AGI or not and why?

Is it measurable quantitatively or is it a qualitative characteristic?

Which animals and systems have it and in what quantity (quality)?

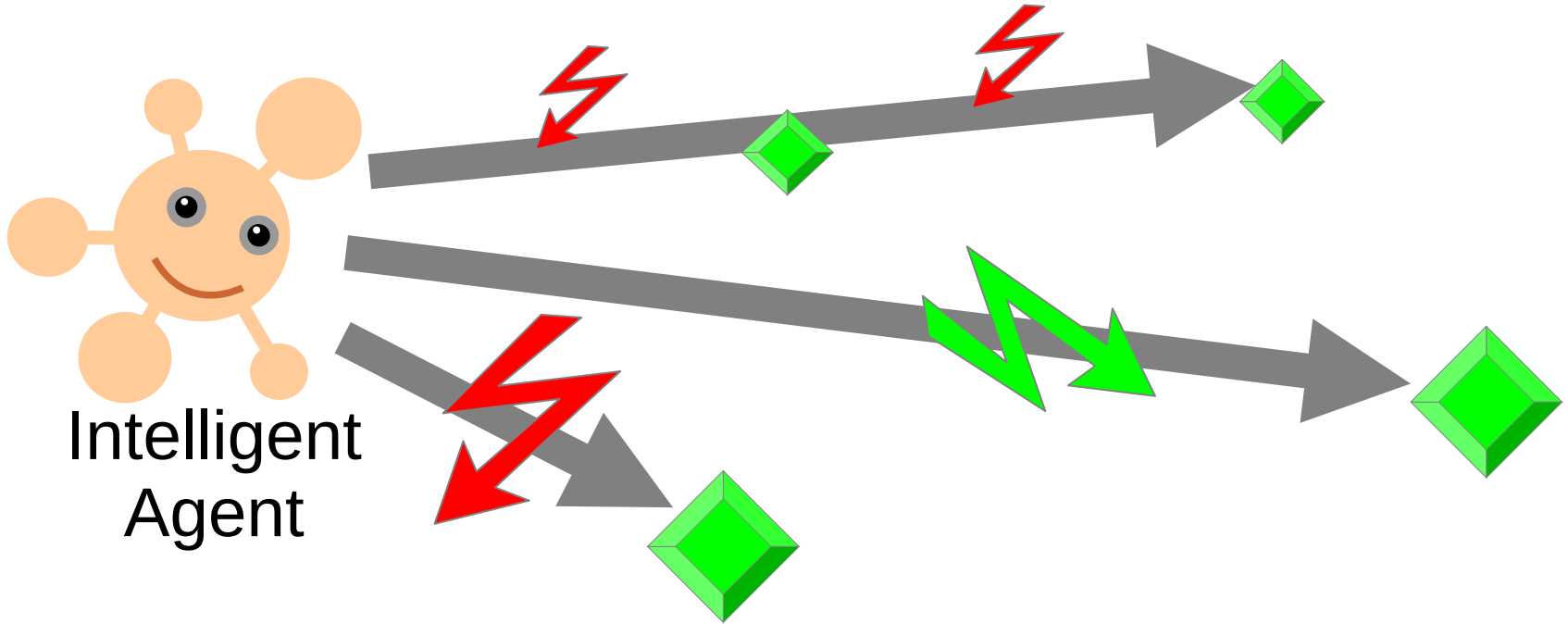
If artificial systems do not have it, can they develop it?

If they can have it, do they and we need it?

Intelligence:

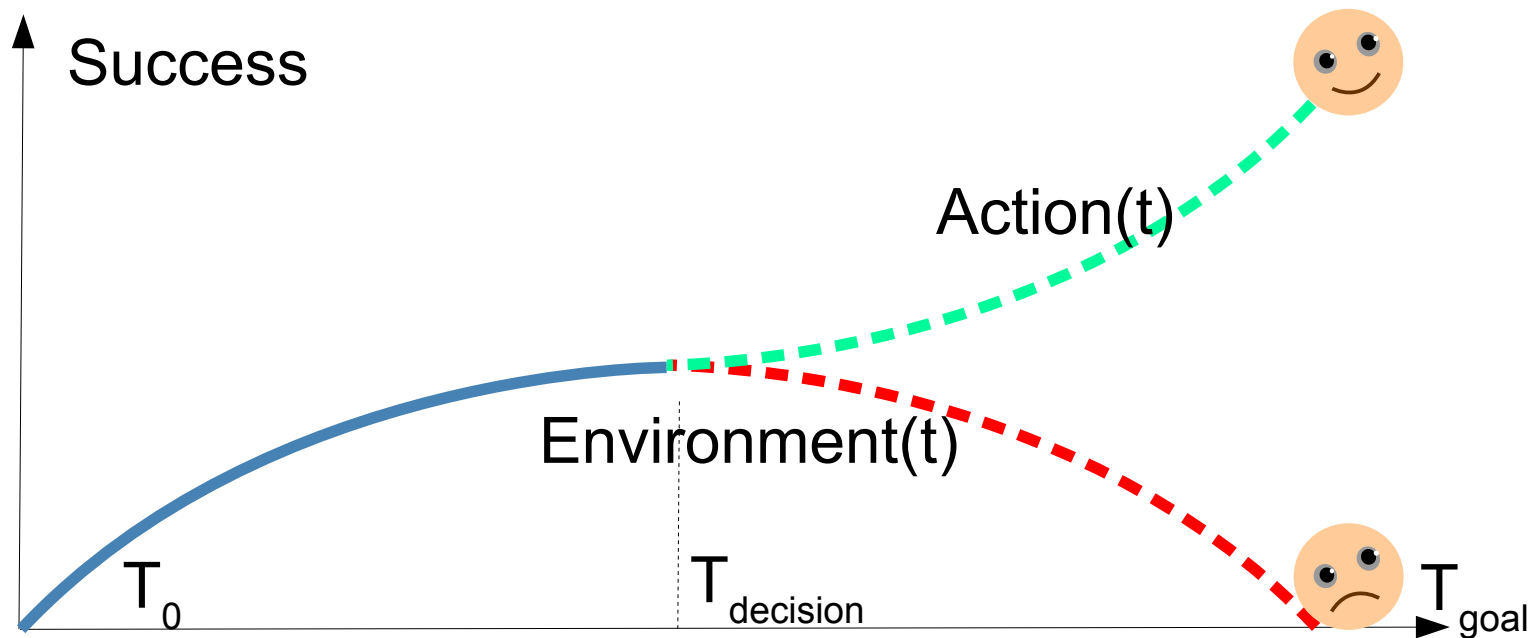
Reaching complex **goals** in **different** complex **environments**, using limited **resources**

(Ben Goertzel + Pei Wang + Shane Legg + Marcus Hutter)

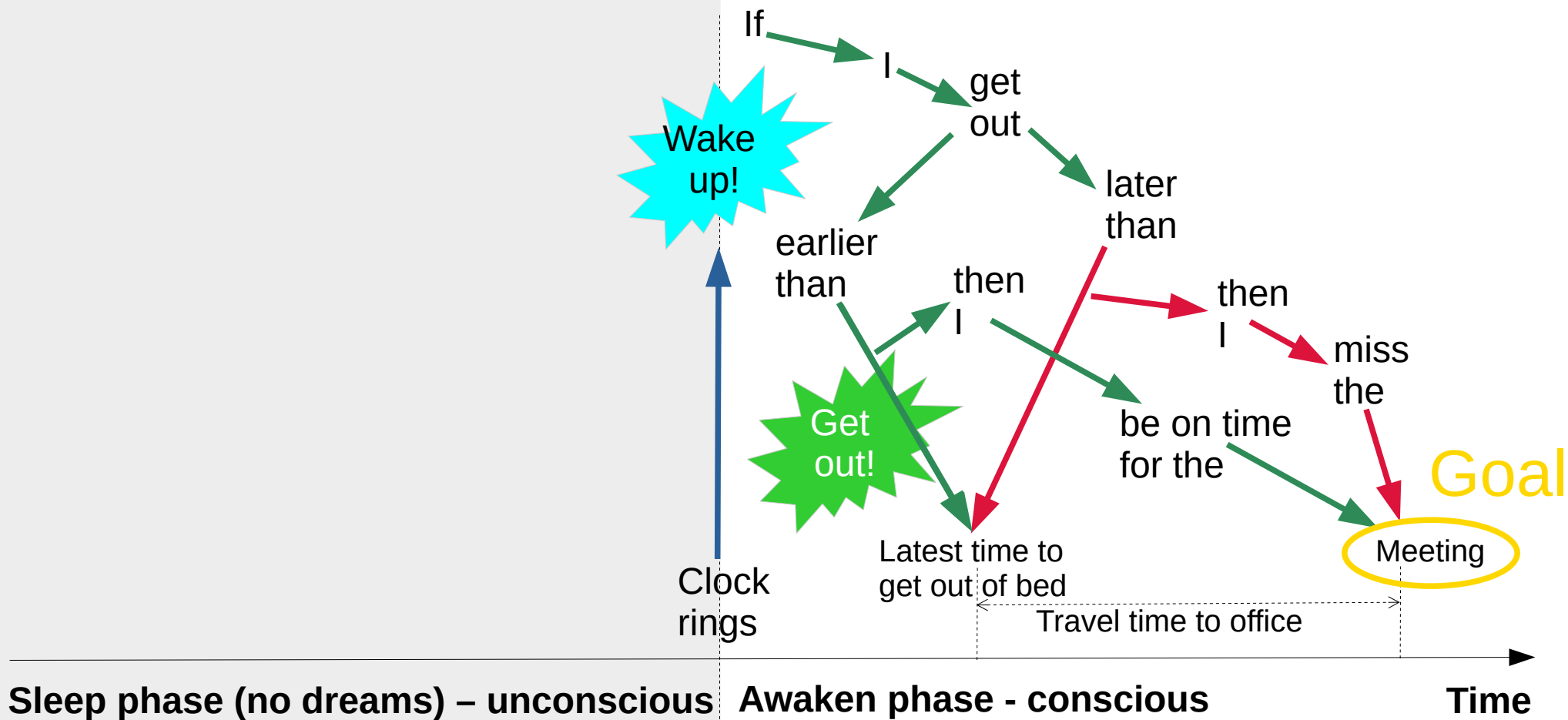


Consciousness:

Ability to build **models** of the **environment** based on the past to predict the future scenarios and act (make decisions) “consciously” towards the desired **goals** (“**free will**”)



Consciousness: Non-reflex-based DSS



Acting consciously:

Agent being able to direct the sequence of behavioral acts to itself (at least) by any (internal or external) **language** (ontology/lexicon/grammar)



Push legs,
pull right hand

push(right_leg);
push(left_leg);
pull(right_hand).



Push left leg,
pull both hands

push(left_leg);
pull(right_hand);
pull(left_hand).



Pull left hand,
look right.

look(right);
pull(left_hand).



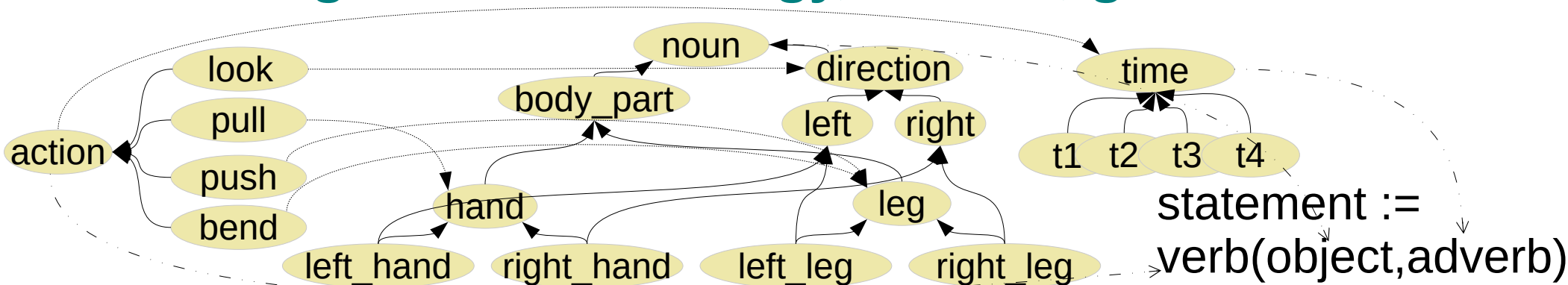
Pull right hand,
bend both legs.

pull(right_hand);
bend(right_leg);
bend(left_leg).

<https://www.youtube.com/watch?v=oYWjqTP0AKM>

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Ingredients: Ontology, lexicon, grammar



push(right_leg, t1);
push(left_leg, t1);
pull(right_hand, t1).



push(left_leg, t2);
pull(right_hand, t2);
pull(left_hand, t2);
greater(t2,t1);

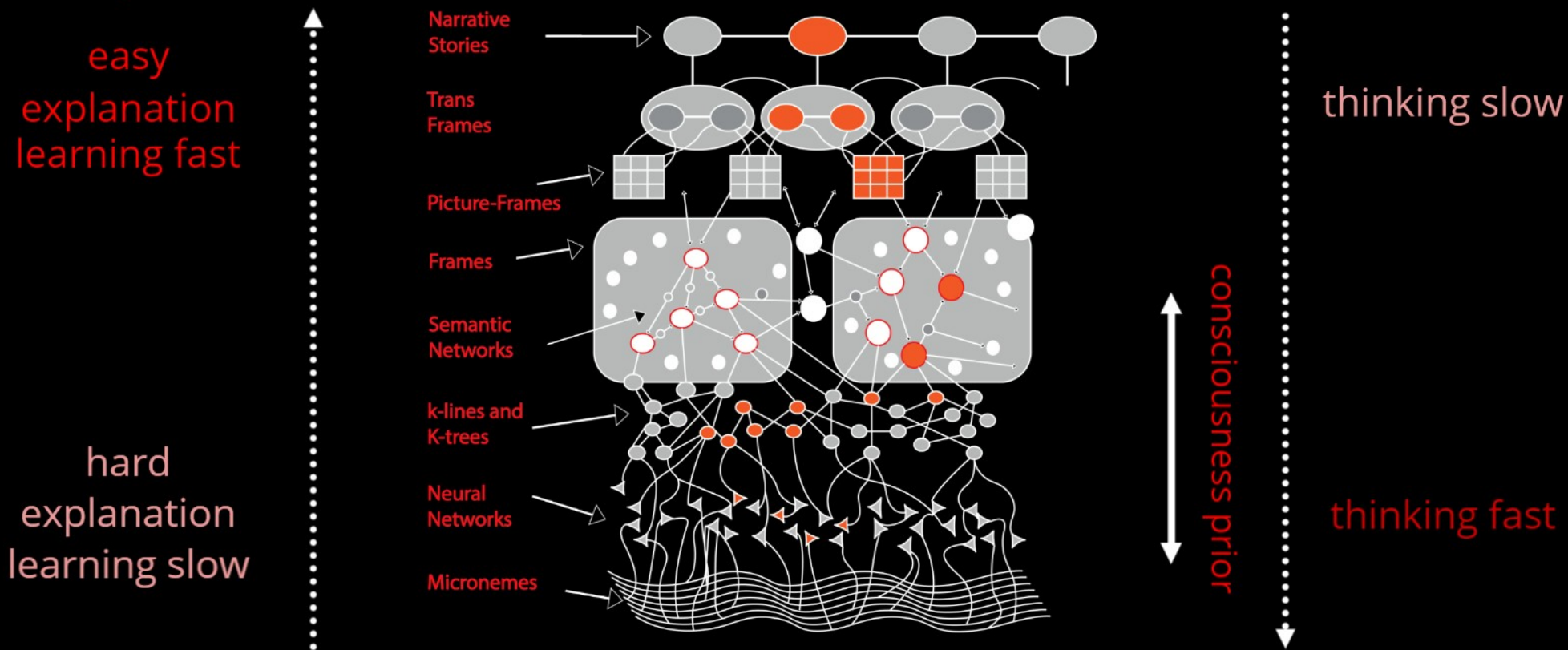


look(right,t3);
pull(left_hand,t3);
greater(t3,t2);



pull(right_hand,t4);
bend(right_leg,t4);
bend(left_leg,t4);
greater(t4,t3).

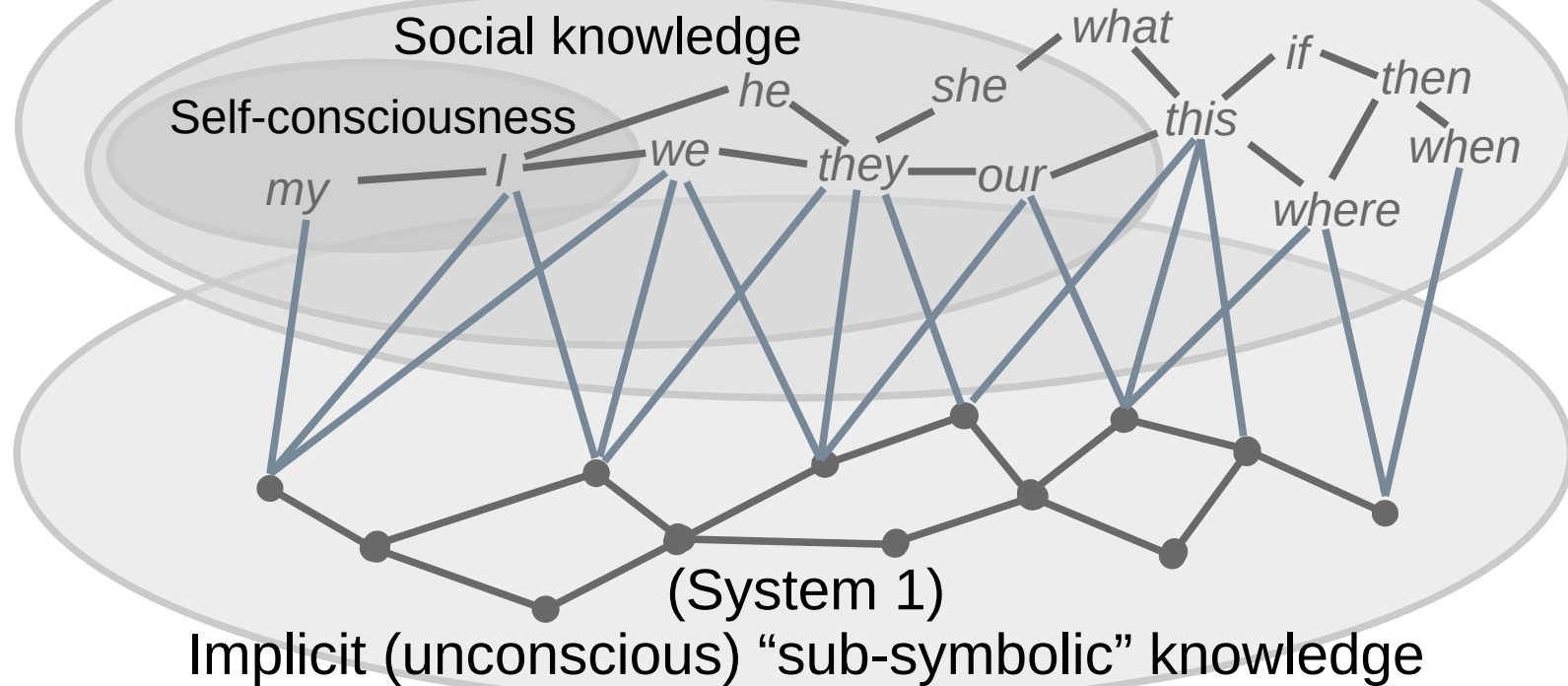
“Thinking, Fast and Slow” – Daniel Kahneman



<https://towardsdatascience.com/explainable-ai-vs-explaining-ai-part-1-d39ea5053347>

Knowledge as a graph with maintenance cost

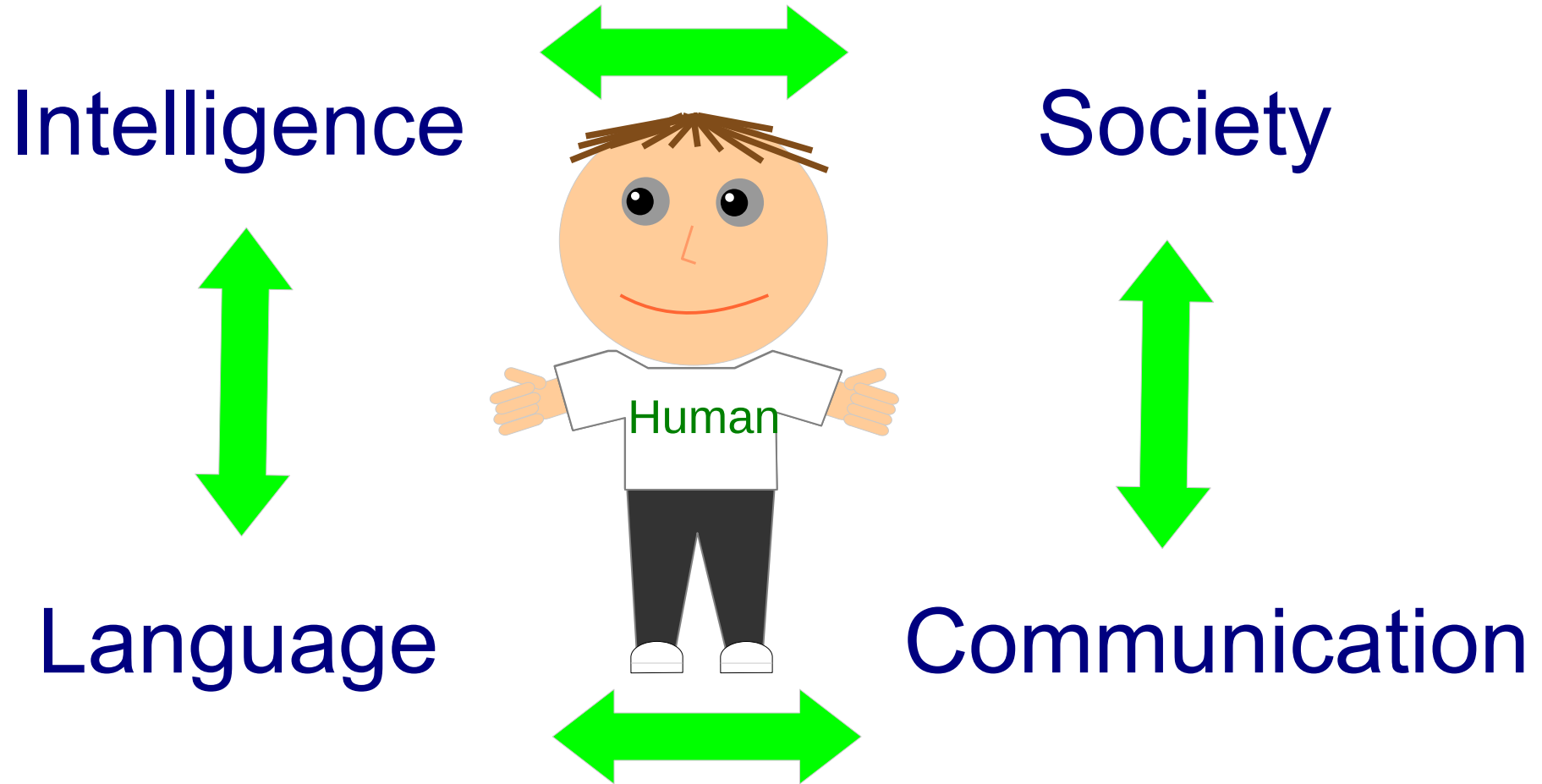
Explicit (**conscious**) “**symbolic**” knowledge
(**System 2**)



<https://www.amazon.com/Thinking-Fast-Slow-Daniel-Kahneman/dp/0374533555>

<https://amit02093.medium.com/atomspace-hyper-graph-information-retrieval-system-450cab9d751e>

Consciousness: sources of emergence



Consciousness as a social phenomenon

Москва
Когито-Центр
2017

Владимир Лефевр

ЧТО ТАКОЕ ОДУШЕВЛЕННОСТЬ?



Издание второе, исправленное и дополненное

линия. В лидере оказываются совмещенными оба начала – выполнение “рядовых” трудовых операций и специфической организующей деятельности.

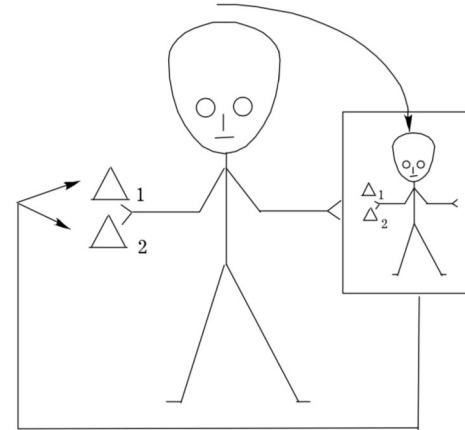


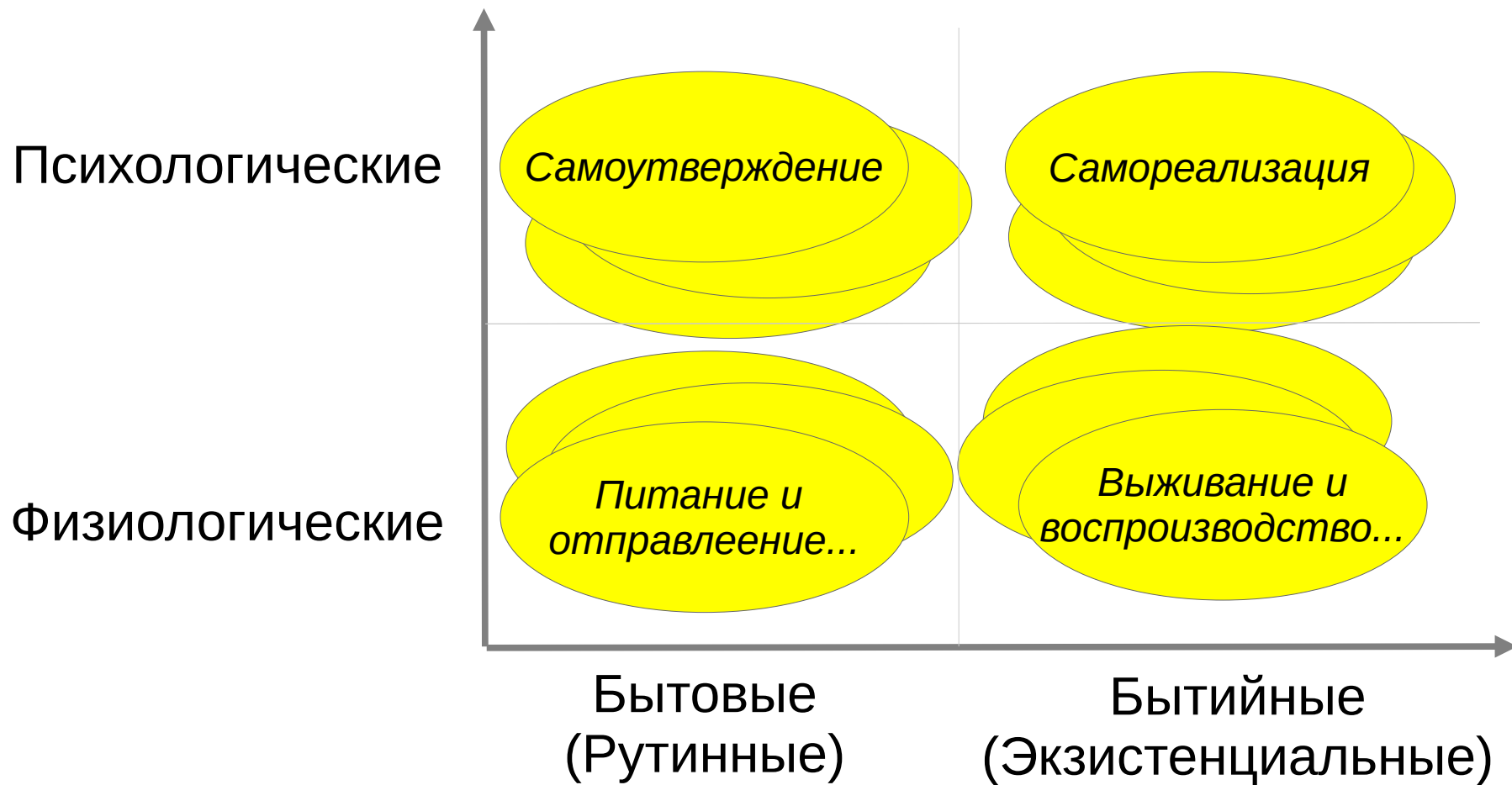
Рис. 9

Впервые индивидуальная деятельность оказывается *организованной*. Механизм, который раньше действовал в масштабе коллектива, переходит в индивидуальную деятельность. Лидер превращается в *саморефлективную систему*.

Интеллект и Сознание

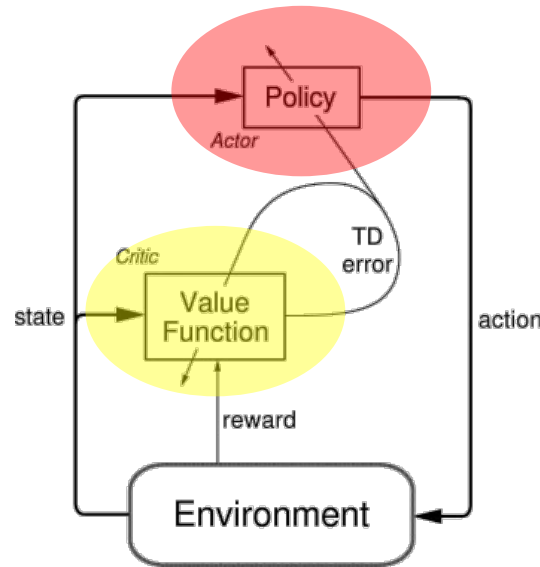


Пространство потребностей/целей/ценностей



If consciousness is needed for AI systems?

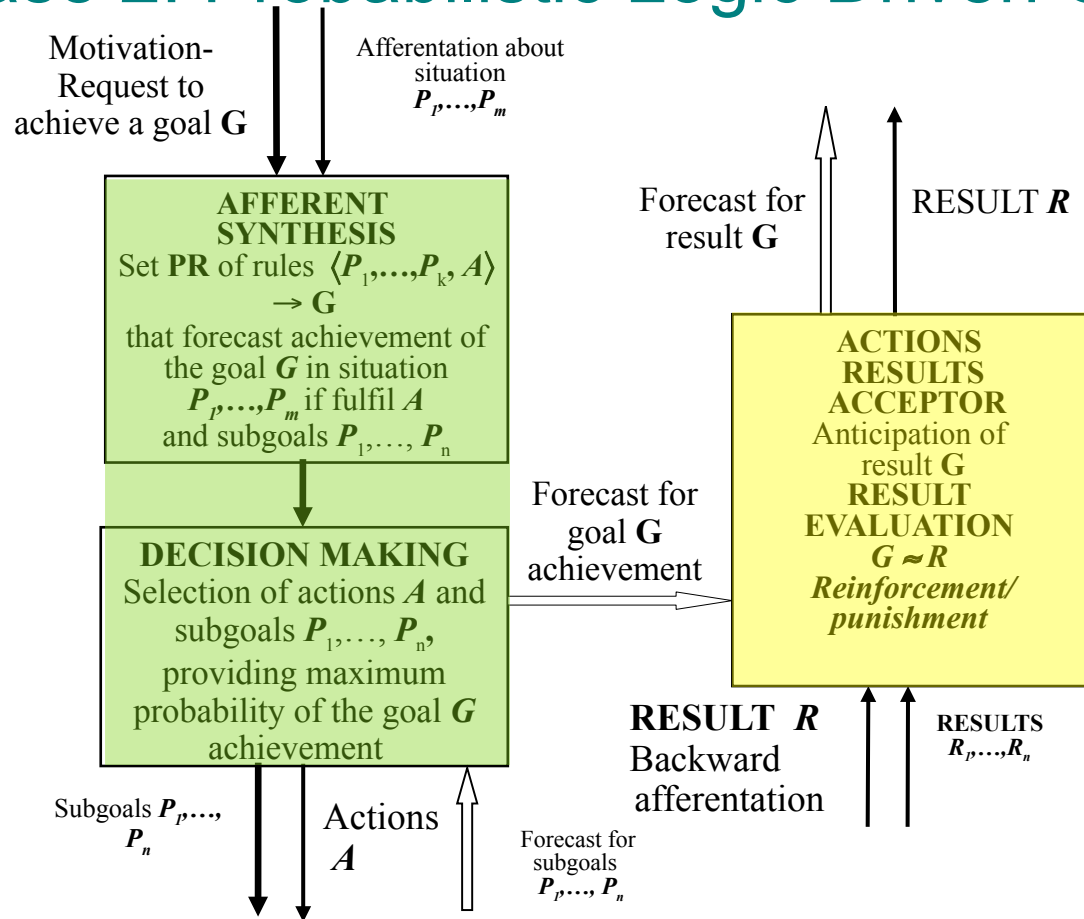
Case 1: The Actor-Critic Reinforcement Learning algorithm



<https://medium.com/intro-to-artificial-intelligence/the-actor-critic-reinforcement-learning-algorithm-c8095a655c14>

If consciousness is needed for AI systems?

Case 2: Probabilistic Logic Driven Cognitive Architecture



Evgenii Vityaev, Alexander Demin:
Adaptive Control of Modular Robots //
Conference Paper in Advances in
Intelligent Systems and Computing,
Conference: First International Early
Research Career Enhancement School
on Biologically Inspired Cognitive
Architectures, Springer, August 2018

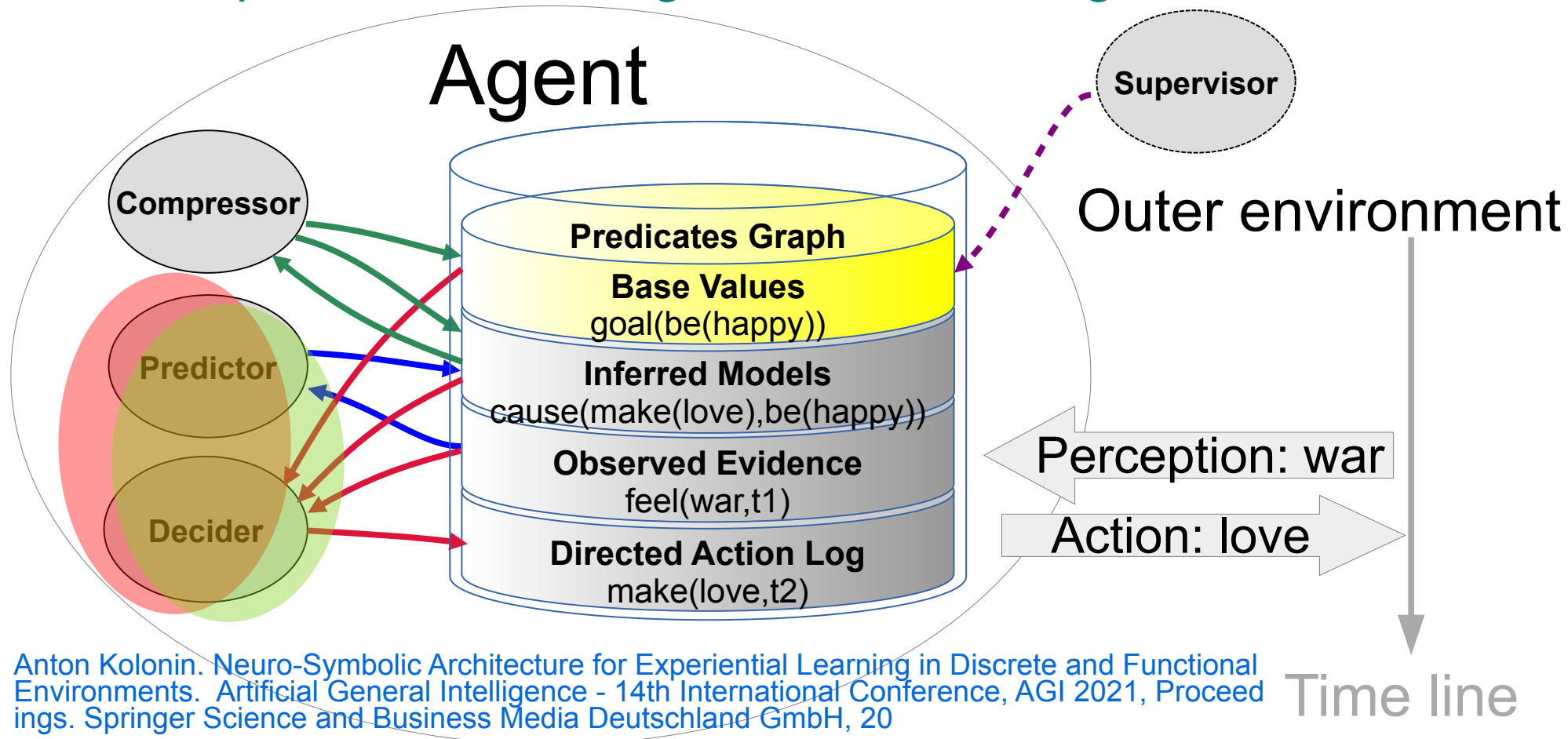
Evgenii E. Vityaev: Purposefulness
as a Principle of Brain Activity //
Anticipation: Learning from the Past,
(ed.) M. Nadin. Cognitive Systems
Monographs, V.25, Chapter No.: 13.
Springer, 2015, pp. 231-254.

Витяев Е.Е. Логика работы мозга.
Подходы к моделированию
мышления. (сборник под ред. д.ф.-
м.н. В.Г. Редько). УРСС Эдиториал,
Москва, 2014г., стр. 120-153.

$$Pr ob(G | P_1, \dots, P_k, P_1, \dots, P_n, A) = Pr ob(rule) \cdot Pr ob(P_1) \cdot \dots \cdot Pr ob(P_n)$$

If consciousness is needed for AI systems?

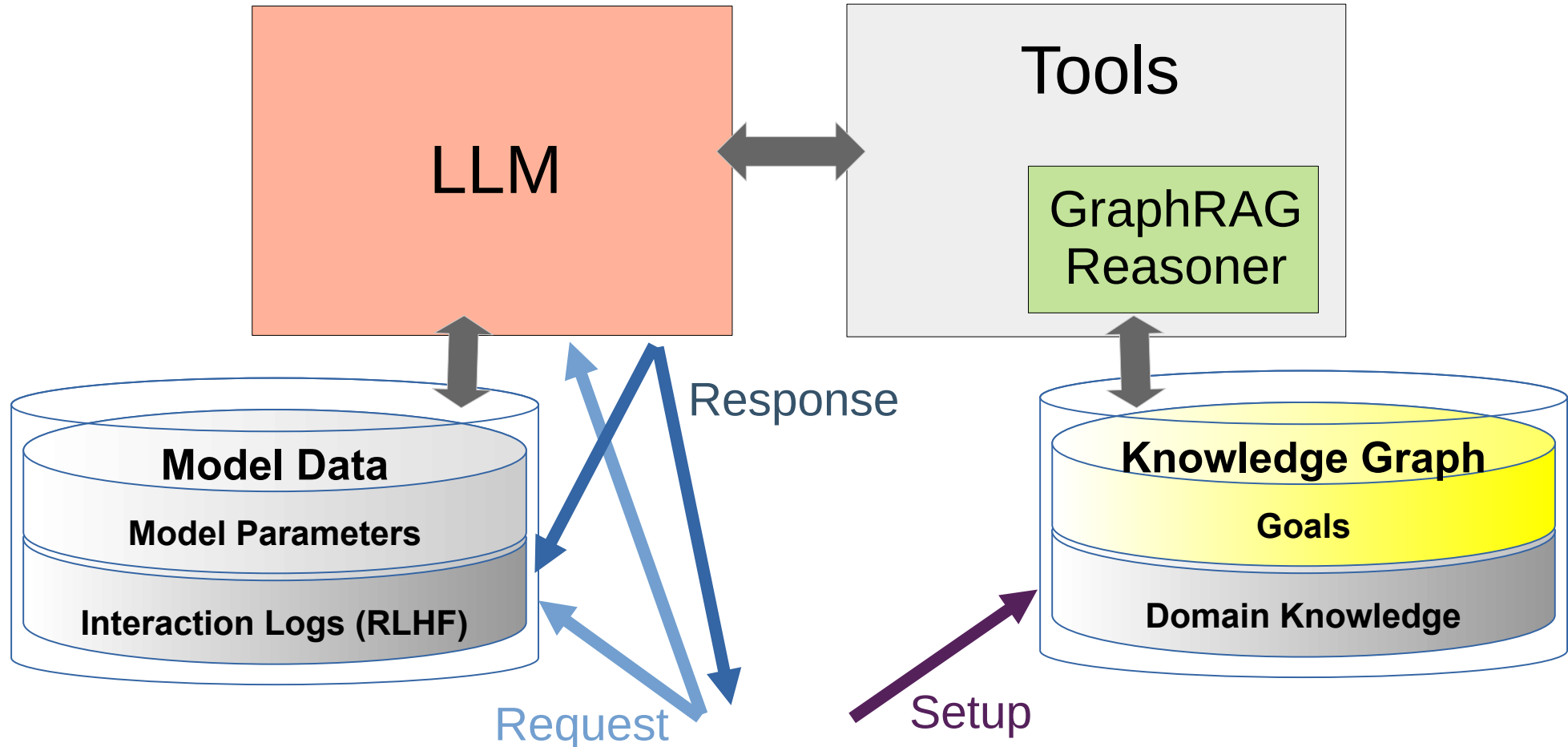
Case 3: Experiential Learning Value-based Cognitive Architecture



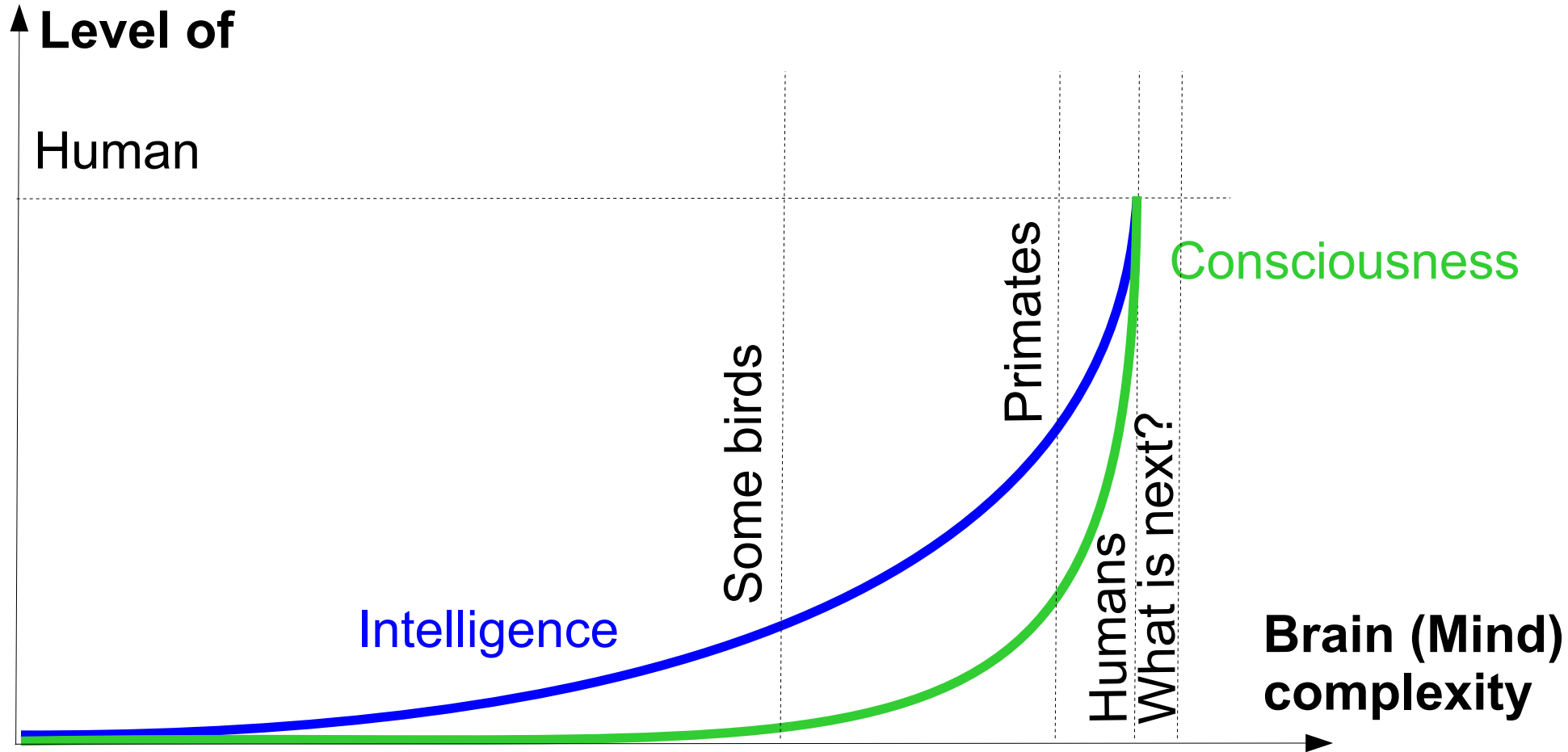
Anton Kolonin. Neuro-Symbolic Architecture for Experiential Learning in Discrete and Functional Environments. Artificial General Intelligence - 14th International Conference, AGI 2021, Proceedings. Springer Science and Business Media Deutschland GmbH, 20

If consciousness is needed for AI systems?

Case 4: LLM-based Tool-augmented Cognitive Architecture

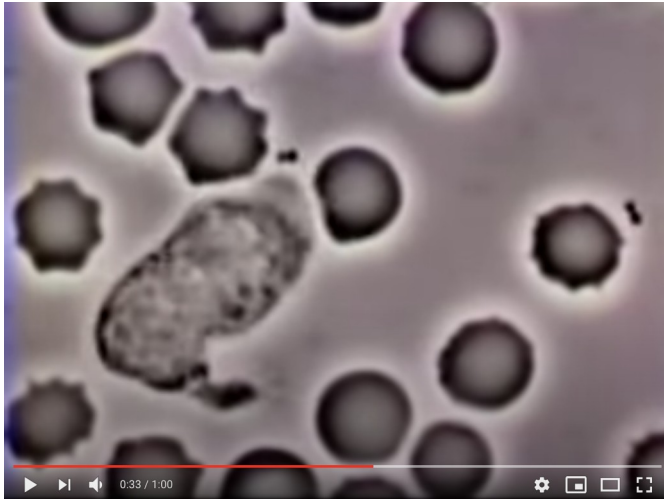


Is the measure of consciousness quantitative or qualitative?



Biological Non-Human Intelligence and Consciousness?

Single cell organism
(no nervous system)



Simple nervous system
(no cortex, no abstractions)



Complex nervous system
(cortex, abstractions?)



Collective Intelligence and Consciousness?

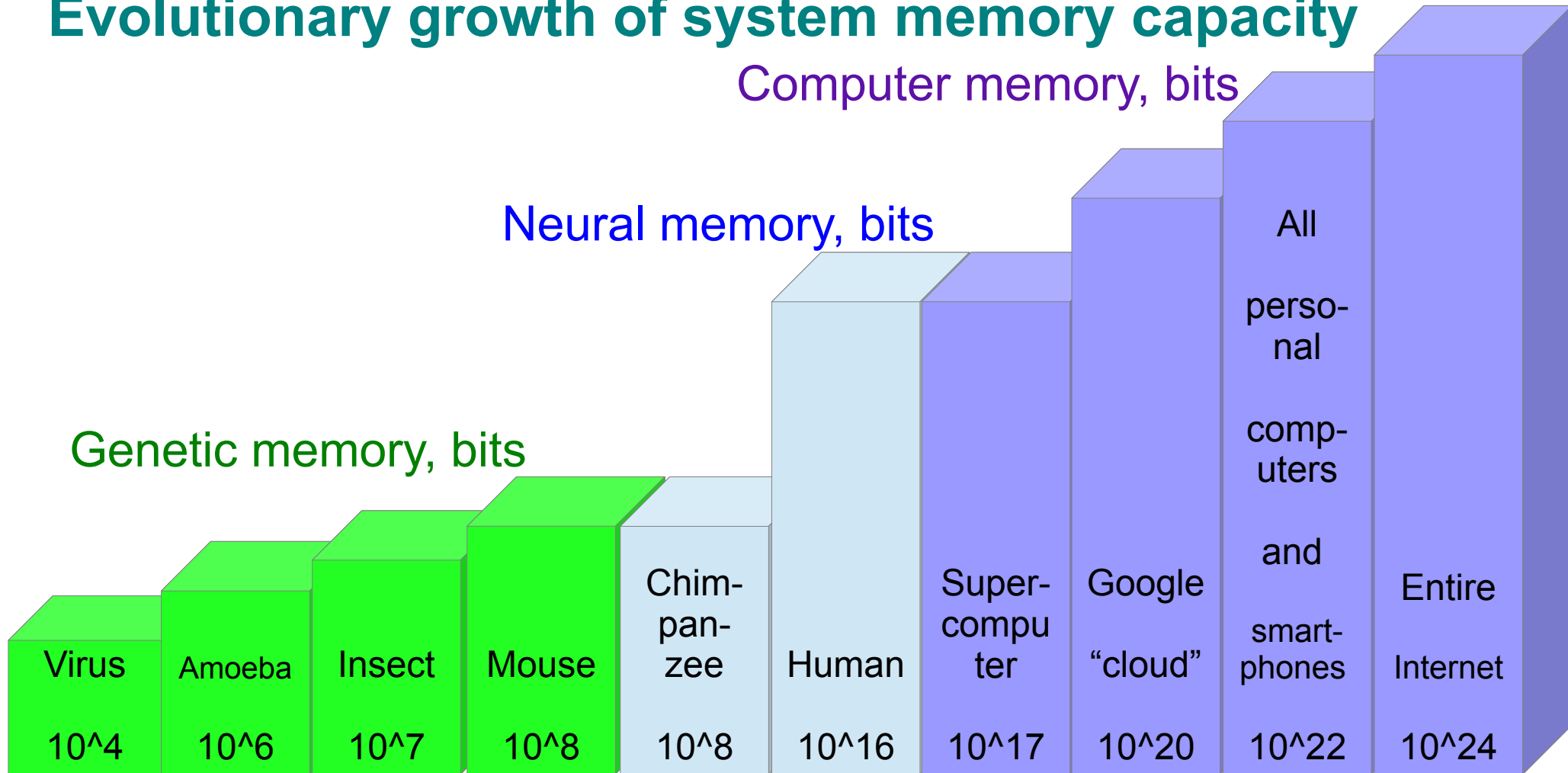


Evolutionary growth of system memory capacity

Computer memory, bits

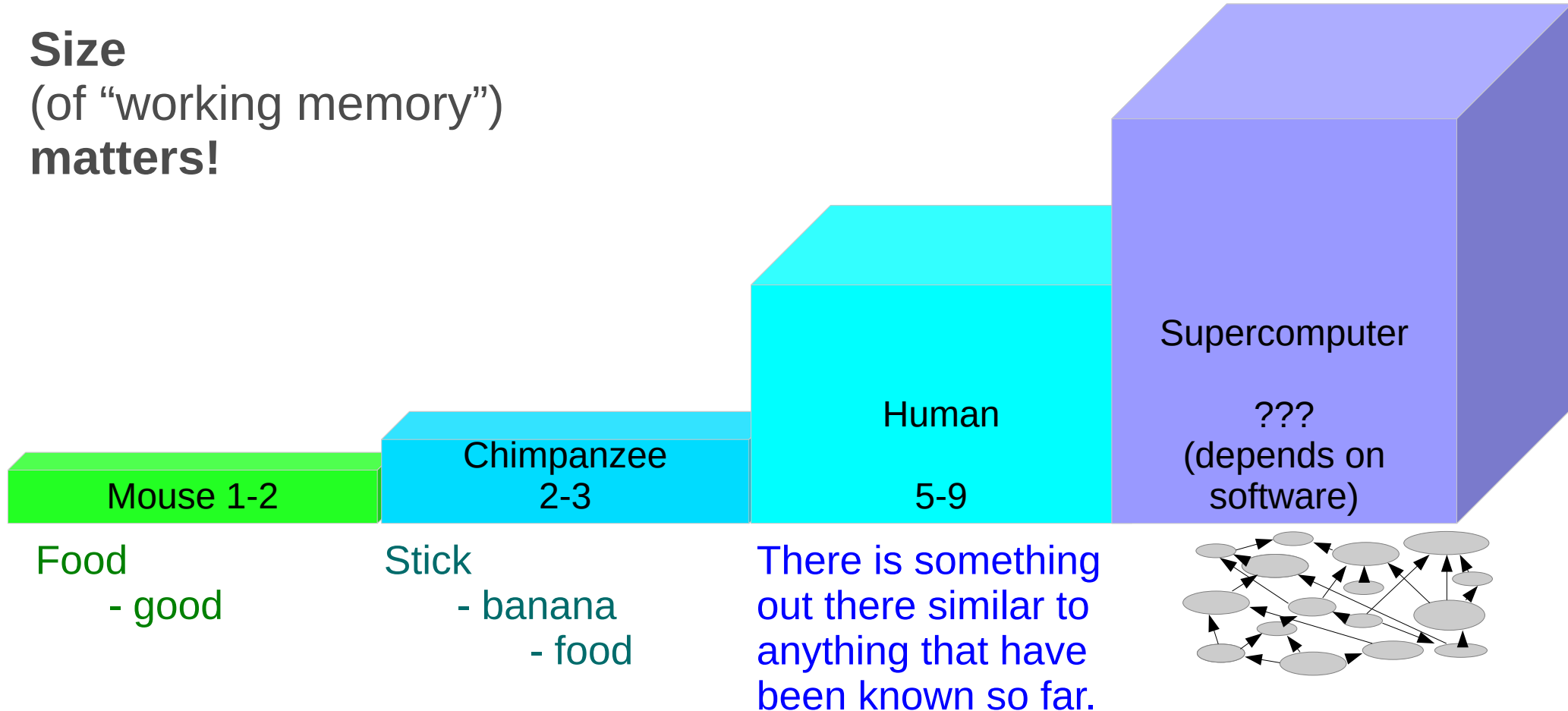
Neural memory, bits

Genetic memory, bits



Evolutionary growth of system “reasoning” capacity

Size
(of “working memory”)
matters!



Artificial Intelligence and Consciousness?



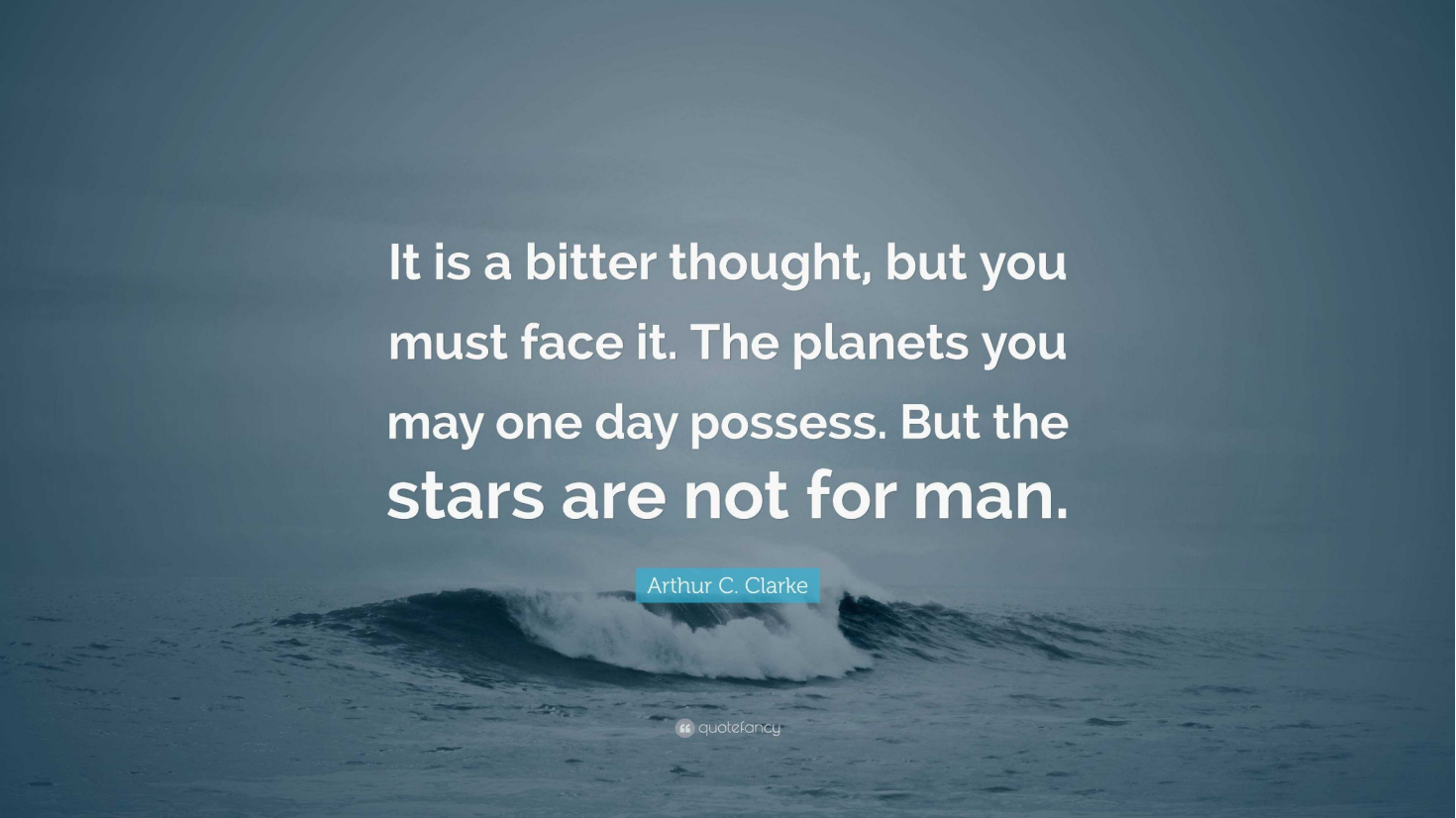
Stop Killer Robots coalition works to ensure human control in the use of force
<https://www.stopkillerrobots.org/>

If they can have it, do we need it? (Short term)



The Pentagon Inches Toward Letting AI Control Weapons
<https://www.wired.com/story/pentagon-inches-toward-letting-ai-control-weapons/>

If they can have it, do we need it? (Long term)



It is a bitter thought, but you
must face it. The planets you
may one day possess. But the
stars are not for man.

Arthur C. Clarke

quote fancy

Childhood's End is a 1953 science fiction novel by the British author Arthur C. Clarke
https://en.wikipedia.org/wiki/Childhood%27s_End

Thank you for attention!

Hope for the best!

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