Note, I have experimented with many more variations of these prompts in the OpenAI playground.

1. Initial prompt to generate 408 strategies (1-shot)
   1. A biological strategy is a characteristic, mechanism, or process that an organism or ecosystem exhibits to accomplish a particular function within a particular context.

The main elements of a biological strategy are:

- The organism or ecosystem

- The part of the organism

- Function (what it does or accomplishes)

- Mechanisms (how it does it)

- Context (environment, conditions, constraints, stressors)

Make sure your strategy is accurate, high-quality, written by an expert, and can be understood by a high school student.

Text: Harbor seal vibrissa morphology suppresses vortex-induced vibrations. Harbor seals (Phoca vitulina) often live in dark and turbid waters, where their mystacial vibrissae, or whiskers, play an important role in orientation. Besides detecting and discriminating objects by direct touch, harbor seals use their whiskers to analyze water movements, for example those generated by prey fish or by conspecifics. Even the weak water movements left behind by objects that have passed by earlier can be sensed and followed accurately (hydrodynamic trail following). While scanning the water for these hydrodynamic signals at a swimming speed in the order of meters per second, the seal keeps its long and flexible whiskers in an abducted position, largely perpendicular to the swimming direction. Remarkably, the whiskers of harbor seals possess a specialized undulated surface structure, the function of which was, up to now, unknown. Here, we show that this structure effectively changes the vortex street behind the whiskers and reduces the vibrations that would otherwise be induced by the shedding of vortices from the whiskers (vortex-induced vibrations). Using force measurements, flow measurements and numerical simulations, we find that the dynamic forces on harbor seal whiskers are, by at least an order of magnitude, lower than those on sea lion (Zalophus californianus) whiskers, which do not share the undulated structure. The results are discussed in the light of pinniped sensory biology and potential biomimetic applications.

Strategy: A harbor seal’s whiskers possess an undulated surface structure that reduces vortex-induced vibrations while moving through the water

Organism: harbor seal

Part of: whiskers

Function: reduces vortex-induced vibrations

Mechanisms: undulated surface structure

Context: moving through water

Text:{}

Strategy:

* 1. The output of GPT isn’t exactly what we are looking for, it does capture important information.

1. Few-shot + Active Learning Approach
   1. Too costly
   2. Decent results
2. Initial prompt (few-shot → 3-shot)
   1. A biological strategy is a characteristic, mechanism, or process that an organism or ecosystem exhibits to accomplish a particular function within a particular context

The main elements of a biological strategy are:

- The organism or ecosystem

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- Function (what it does or accomplishes)

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Make sure your strategy is accurate, high-quality, written by an expert, and can be understood by a high school student.

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Strategy: A harbor seal’s whiskers possess an undulated surface structure that reduces vortex-induced vibrations while moving through the water\n\nOrganism: harbor seal

Part of: whiskers

Function: reduces vortex-induced vibration

Mechanisms: undulated surface structure

Context: moving through water

Text: Building a home from foam-túngara frog foam nest architecture and three-phase construction process. frogs that build foam nests floating on water face the problems of over-dispersion of the secretions used and eggs being dangerously exposed at the foam : air interface. nest construction behaviour of tungara frogs, engystomops pustulosus, has features that may circumvent these problems. pairs build nests in periodic bursts of foam production and egg deposition, three discrete phases being discernible. the first is characterized by a bubble raft without egg deposition and an approximately linear increase in duration of mixing events with time. this phase may reduce initial over-dispersion of foam precursor materials until a critical concentration is achieved. the main building phase is marked by mixing events and start-to-start intervals being nearly constant in duration. during the final phase, mixing events do not change in duration but intervals between them increase in an exponential-like fashion. pairs joining a colonial nesting abbreviate their initial phase, presumably by exploiting a pioneer pair's bubble raft, thereby reducing energy and material expenditure, and time exposed to predators. finally, eggs are deposited only in the centre of nests with a continuously produced, approximately 1 cm deep egg-free cortex that protectively encloses hatched larvae in stranded nests.

Strategy: Túngara frogs protectively enclose hatched larvae by building nests in periodic bursts of foam production and egg deposition on water.

Organism: Túngara frog

Part of: nest

Function: protectively encloses hatched larvae

Mechanisms: building nests

Text: DIFFERENCES IN POLYSACCHARIDE STRUCTURE BETWEEN CALCIFIED AND UNCALCIFIED SEGMENTS IN THE CORALLINE CALLIARTHRON CHEILOSPORIOIDES (CORALLINALES, RHODOPHYTA) 1. the articulated coralline calliarthron cheilosporioides manza produces segmented fronds composed of calcified segments (intergenicula) separated by uncalcified joints (genicula), which allow fronds to bend and reorient under breaking waves in the wave-swept intertidal zone. genicula are formed when calcified cells decalcify and restructure to create flexible tissue. the present study has identified important differences in the main agaran disaccharidic repeating units [\\u21923)-\\u03b2-d-galp (1\\u2192 4)-\\u03b1-l-galp(1\\u2192] synthesized by genicular and intergenicular segments. based on chemical and spectroscopical analyses, we report that genicular cells from c. cheilosporioides biosynthesize a highly methoxylated galactan at c-6 position with low levels of branching with xylose side stubs on c-6 of the [\\u21923)-\\u03b2-d-galp (1\\u2192] units, whereas intergenicular segments produce xylogalactans with high levels of xylose and low levels of 6-o-methyl \\u03b2-d-gal units. these data suggest that, during genicular development, xylosyl branched, 3-linked \\u03b2-d-galp units present in the xylogalactan backbones from intergenicular walls are mostly replaced by 6-o-methyl-d-galactose units. we speculate that this structural shift is a consequence of a putative and specific methoxyl transferase that blocks the xylosylation on c-6 of the 3-linked \\u03b2-d-galp units. changes in galactan substitutions may contribute to the distinct mechanical properties of genicula and may lend insight into the calcification process in coralline algae.

Strategy: The articulated coralline Calliarthron cheilosporioides produces segmented fronds composed of calcified segments separated by uncalcified joints which allow fronds to bend and reorient under breaking waves.

Organism: Calliarthron cheilosporioides

Part of: frond

Function: allow fronds to bend and reorient under breaking waves

Mechanisms: segmented fronds, calcified segments, uncalcified joints

Context: wave-swept intertidal zone

Text:{}

Strategy:

* 1. One thing is for certain, that GPT-3 can indeed pull biological strategies from the abstract. They may not be correct always, but it looks like it does it well enough.
  2. The issue is that the strategy sometimes does not have the function or mechanism, which are arguably the most important parts. The whole point of biomimicry is to design a human system based on a biological system, and if the “function” and “how the function is completed” are not present in the strategy abstracted/extracted from the text, then the tool we are creating is not doing its job.
     1. Therefore, it is clear; we need to re-engineer the prompt, such that we tell GPT to “put more importance in finding” the function and mechanism.

1. Modified prompt with bottom-up approach starting from function (0-shot) [no strategy]
   1. Find the function of the organism.

Also Find how the mechanism, as in how does the organism do the function?

Also Find the context, for which it completes the function. This could be a place, or situation.

Also Find the organism.

Also Find the part of the organism that is used to complete the function.

Text: {}

Function:

* 1. ⅖ for function, ⅖ for mechanism. It gets the function partially correct, but is missing important information mostly.

1. Only get function and Mechanism (0-shot)
   1. Find the function of the organism, as in what is the organism trying to accomplish?

Find the mechanism of the organism, as in how does it do this?

Text: {}

Function:

* 1. ⅗ correct outputs

1. Modified get function and Mechanism (0-shot)
   1. Find the function of the organism, as in what is the organism trying to accomplish?

Find the mechanism of the organism, describe how the organism does this?

Text: {}

Function:

* 1. ⅗ correc outputs, But, very good quality summaries → good enough to move on?

1. Get Function, Name, and Mechanism (0-shot)
   1. Find the function of the organism, as in what is the organism trying to accomplish?

Find the mechanism of the organism, describe how the organism does the function.

Find the name of the organism.

Text: {}

Function:

* 1. Can’t find the name of the organism

1. Get Function, Mechanism, and Context (3 most important aspects of the startegy) (0-shot)
   1. Find the function of the organism, as in what is the organism trying to accomplish?

Find the mechanism of the organism, describe how the organism does the function.

Find the context of the organism performing the function. This could be a place, condition, or situation.

Text: {}

Function:

* 1. 5 samples
     1. ⅗ correct outputs, ⅘ for mechanism
     2. Move onto getting the part of the organism
  2. 20 samples
     1. In total there are 11 correct generated outputs, 7 wrong, and 2 where I am not sure about if they are wrong or correct.
     2. Out of the 7 wrong generated outputs, most are actually partially correct

1. Get the Function, Mechanism, Context, and Part of (0-shot)
   1. Find the function of the organism, as in what is the organism trying to accomplish?

Find the mechanism of the organism, describe how the organism does the function.

Find the context of the organism performing the function. This could be a place, condition, or situation.

Find the part of the organism that is performing the function.

Text: {}

Function:

* 1. ⅗ correct outputs, ⅘ for mechanism
  2. GPT does a great job extracting the summaries from the title and abstract.
  3. The issue is that some of the abstracts do not mention a body part. It also slightly modifies the results as compared to before.
  4. For this reason, I believe that the part of should be a separate request

1. Get the Organism and Part of (0-shot)
   1. The function of the organism is what it is trying to accomplish.

Find the organism that is performing the function.

Find the part of the organism that is performing the function, if stated in the text. If it is not stated, print "None".

Text: {}

Organism:

* 1. 5 samples
     1. ⅘ correct outputs
     2. Always gets organism correct
  2. 20 samples
     1. In total there are 13 correct generated outputs, 7 wrong
     2. Out of the 7 wrong generated outputs, 6 are actually partially correct
        1. 5/7 have correct organism
        2. 1/7 has the incorrect organism
        3. 1/7 has both wrong
     3. Therefore, 18 out of the 20 summaries correctly abstract the organism with this prompt, and 14 out of 20 get the correct part of the organism.

1. Get Function, Mechanism, Context, Organism and Part of (0-shot)
   1. The function of the organism is what it is trying to accomplish.

Find the function of the organism, as in what is the organism trying to accomplish?

Find the mechanism of the organism, describe how the organism does the function.

Find the context of the organism performing the function. This could be a place, condition, or situation.

Find the organism that is performing the function.

Find the part of the organism that is performing the function, if stated in the text. If it is not stated, print "None".

Text: {}

Organism:

* 1. Issue is that it cannot find the part → always prints None
  2. ⅘ for function
  3. ⅗ for mechanism
  4. 100% for organism
  5. ⅘ for context

1. Get Function, Mechanism, and Context (3 most important aspects of the startegy) (1-shot)
   1. Find the function of the organism, as in what is the organism trying to accomplish?

Find the mechanism of the organism, describe how the organism does the function.

Find the context of the organism performing the function. This could be a place, condition, or situation.

Text: Harbor seal vibrissa morphology suppresses vortex-induced vibrations. Harbor seals (Phoca vitulina) often live in dark and turbid waters, where their mystacial vibrissae, or whiskers, play an important role in orientation. Besides detecting and discriminating objects by direct touch, harbor seals use their whiskers to analyze water movements, for example those generated by prey fish or by conspecifics. Even the weak water movements left behind by objects that have passed by earlier can be sensed and followed accurately (hydrodynamic trail following). While scanning the water for these hydrodynamic signals at a swimming speed in the order of meters per second, the seal keeps its long and flexible whiskers in an abducted position, largely perpendicular to the swimming direction. Remarkably, the whiskers of harbor seals possess a specialized undulated surface structure, the function of which was, up to now, unknown. Here, we show that this structure effectively changes the vortex street behind the whiskers and reduces the vibrations that would otherwise be induced by the shedding of vortices from the whiskers (vortex-induced vibrations). Using force measurements, flow measurements and numerical simulations, we find that the dynamic forces on harbor seal whiskers are, by at least an order of magnitude, lower than those on sea lion (Zalophus californianus) whiskers, which do not share the undulated structure. The results are discussed in the light of pinniped sensory biology and potential biomimetic applications.

Function: reduces vortex-induced vibrations

Mechanisms: undulated surface structure

Context: moving through water

Text: {}

Function:

* 1. 5 samples
     1. ⅖ correct outputs
     2. Out of the 3 that are incorrect
        1. 2 are wrong only because GPT abstracted the wrong context
           1. Gets “part of”
        2. 1 is wrong because mechanism and context are incorrect

1. Get Function, Mechanism, and Context (3 most important aspects of the startegy) (2-shot)
   1. Find the function of the organism, as in what is the organism trying to accomplish?

Find the mechanism of the organism, describe how the organism does the function.

Find the context of the organism performing the function. This could be a place, condition, or situation.

Text: Harbor seal vibrissa morphology suppresses vortex-induced vibrations. Harbor seals (Phoca vitulina) often live in dark and turbid waters, where their mystacial vibrissae, or whiskers, play an important role in orientation. Besides detecting and discriminating objects by direct touch, harbor seals use their whiskers to analyze water movements, for example those generated by prey fish or by conspecifics. Even the weak water movements left behind by objects that have passed by earlier can be sensed and followed accurately (hydrodynamic trail following). While scanning the water for these hydrodynamic signals at a swimming speed in the order of meters per second, the seal keeps its long and flexible whiskers in an abducted position, largely perpendicular to the swimming direction. Remarkably, the whiskers of harbor seals possess a specialized undulated surface structure, the function of which was, up to now, unknown. Here, we show that this structure effectively changes the vortex street behind the whiskers and reduces the vibrations that would otherwise be induced by the shedding of vortices from the whiskers (vortex-induced vibrations). Using force measurements, flow measurements and numerical simulations, we find that the dynamic forces on harbor seal whiskers are, by at least an order of magnitude, lower than those on sea lion (Zalophus californianus) whiskers, which do not share the undulated structure. The results are discussed in the light of pinniped sensory biology and potential biomimetic applications.

Function: reduces vortex-induced vibrations

Mechanisms: undulated surface structure

Context: moving through water

Text: Building a home from foam-túngara frog foam nest architecture and three-phase construction process. frogs that build foam nests floating on water face the problems of over-dispersion of the secretions used and eggs being dangerously exposed at the foam : air interface. nest construction behaviour of tungara frogs, engystomops pustulosus, has features that may circumvent these problems. pairs build nests in periodic bursts of foam production and egg deposition, three discrete phases being discernible. the first is characterized by a bubble raft without egg deposition and an approximately linear increase in duration of mixing events with time. this phase may reduce initial over-dispersion of foam precursor materials until a critical concentration is achieved. the main building phase is marked by mixing events and start-to-start intervals being nearly constant in duration. during the final phase, mixing events do not change in duration but intervals between them increase in an exponential-like fashion. pairs joining a colonial nesting abbreviate their initial phase, presumably by exploiting a pioneer pair's bubble raft, thereby reducing energy and material expenditure, and time exposed to predators. finally, eggs are deposited only in the centre of nests with a continuously produced, approximately 1 cm deep egg-free cortex that protectively encloses hatched larvae in stranded nests.

Function: protectively encloses hatched larvae

Mechanism: building nests

Context: periodic bursts of foam production on water

Text: {}

Function:

* 1. 5 samples
     1. 2-shot → ⅖
        1. Lower quality than outputs than 1-shot
     2. 3-shot → ⅖
        1. same outputs as 2-shot

1. Get Biological Strategy and all other information (1-shot)
   1. A biological strategy is a characteristic, mechanism, or process that an organism or ecosystem exhibits to accomplish a particular function within a particular context.

The main elements of a biological strategy are:

- The organism or ecosystem

- The part of the organism

- Function (what it does or accomplishes)

- Mechanisms (how it does it)

- Context (environment, conditions, constraints, stressors)

Text: Building a home from foam-túngara frog foam nest architecture and three-phase construction process. frogs that build foam nests floating on water face the problems of over-dispersion of the secretions used and eggs being dangerously exposed at the foam : air interface. nest construction behaviour of tungara frogs, engystomops pustulosus, has features that may circumvent these problems. pairs build nests in periodic bursts of foam production and egg deposition, three discrete phases being discernible. the first is characterized by a bubble raft without egg deposition and an approximately linear increase in duration of mixing events with time. this phase may reduce initial over-dispersion of foam precursor materials until a critical concentration is achieved. the main building phase is marked by mixing events and start-to-start intervals being nearly constant in duration. during the final phase, mixing events do not change in duration but intervals between them increase in an exponential-like fashion. pairs joining a colonial nesting abbreviate their initial phase, presumably by exploiting a pioneer pair's bubble raft, thereby reducing energy and material expenditure, and time exposed to predators. finally, eggs are deposited only in the centre of nests with a continuously produced, approximately 1 cm deep egg-free cortex that protectively encloses hatched larvae in stranded nests.

Organism: Túngara frog

Part of: Nest

Function: protect hatched larvae

Mechanism: building nests

Context: periodic bursts of foam production and egg deposition on water

Strategy: Túngara frogs protectively enclose hatched larvae by building nests in periodic bursts of foam production and egg deposition on water

Text: {}

Organism:

* 1. This prompt does a great job of getting the organism, function and mechanism.
  2. But, The strategy will always be incorrect if it is missing information or any of the elements of it are incorrect, which is mostly the case for this prompt

1. Modify above prompt and Get Biological Strategy and all other information (1-shot)

A biological strategy is a characteristic, mechanism, or process that an organism or ecosystem exhibits to accomplish a particular function within a particular context.

The main elements of a biological strategy are:

- The function of the organism, as in what is the organism trying to accomplish?

- The mechanism of the organism, describe how the organism does the function.

- The context of the organism performing the function. This could be a place, condition, or situation.

- The organism or ecosystem is performing the function.

- The part of the organism that is used to perform the function if it is stated in the text.

Make sure the biological strategy is composed of the function, mechanism, context, organism, and part of the organism.

Text: Building a home from foam-túngara frog foam nest architecture and three-phase construction process. frogs that build foam nests floating on water face the problems of over-dispersion of the secretions used and eggs being dangerously exposed at the foam : air interface. nest construction behaviour of tungara frogs, engystomops pustulosus, has features that may circumvent these problems. pairs build nests in periodic bursts of foam production and egg deposition, three discrete phases being discernible. the first is characterized by a bubble raft without egg deposition and an approximately linear increase in duration of mixing events with time. this phase may reduce initial over-dispersion of foam precursor materials until a critical concentration is achieved. the main building phase is marked by mixing events and start-to-start intervals being nearly constant in duration. during the final phase, mixing events do not change in duration but intervals between them increase in an exponential-like fashion. pairs joining a colonial nesting abbreviate their initial phase, presumably by exploiting a pioneer pair's bubble raft, thereby reducing energy and material expenditure, and time exposed to predators. finally, eggs are deposited only in the centre of nests with a continuously produced, approximately 1 cm deep egg-free cortex that protectively encloses hatched larvae in stranded nests.

Function: protect hatched larvae

Mechanism: building nests

Context: periodic bursts of foam production and egg deposition on water

Organism: Túngara frog

Part of: Nest

Strategy: Túngara frogs protectively enclose hatched larvae by building nests during periodic bursts of foam production and egg deposition on water

Text: {}

Function:

* 1. 5 samples
     1. Organism → 5/5
     2. Part Of → 5/5
     3. Function → 5/5
     4. Context → 4/5
     5. Mechanism → 5/5
     6. Strategy → 0/5
        1. It is always missing information
  2. 15 samples
     1. Organism → 15/15
     2. Part Of → 14/15
     3. Function → 15/15
     4. Context → 11/15
     5. Mechanism → 14/15
     6. Strategy → 0/15
        1. It is always missing information

Other prompts (not good enough)

1. What is the strategy? (2-shot)
   1. A biological strategy is a characteristic, mechanism, or process that an organism or ecosystem exhibits to accomplish a particular function within a particular context.

The main elements of a biological strategy are:

- The organism or ecosystem

- The part of the organism

- Function (what it does or accomplishes)

- Mechanisms (how it does it)

- Context (environment, conditions, constraints, stressors)

Make sure your strategy is accurate, high-quality, written by an expert, and can be understood by a high school student.

Text: Harbor seal vibrissa morphology suppresses vortex-induced vibrations. Harbor seals (Phoca vitulina) often live in dark and turbid waters, where their mystacial vibrissae, or whiskers, play an important role in orientation. Besides detecting and discriminating objects by direct touch, harbor seals use their whiskers to analyze water movements, for example those generated by prey fish or by conspecifics. Even the weak water movements left behind by objects that have passed by earlier can be sensed and followed accurately (hydrodynamic trail following). While scanning the water for these hydrodynamic signals at a swimming speed in the order of meters per second, the seal keeps its long and flexible whiskers in an abducted position, largely perpendicular to the swimming direction. Remarkably, the whiskers of harbor seals possess a specialized undulated surface structure, the function of which was, up to now, unknown. Here, we show that this structure effectively changes the vortex street behind the whiskers and reduces the vibrations that would otherwise be induced by the shedding of vortices from the whiskers (vortex-induced vibrations). Using force measurements, flow measurements and numerical simulations, we find that the dynamic forces on harbor seal whiskers are, by at least an order of magnitude, lower than those on sea lion (Zalophus californianus) whiskers, which do not share the undulated structure. The results are discussed in the light of pinniped sensory biology and potential biomimetic applications.

What is the strategy?

A harbor seal’s whiskers possess an undulated surface structure that reduces vortex-induced vibrations while moving through the water

Text: Building a home from foam-túngara frog foam nest architecture and three-phase construction process. frogs that build foam nests floating on water face the problems of over-dispersion of the secretions used and eggs being dangerously exposed at the foam : air interface. nest construction behaviour of tungara frogs, engystomops pustulosus, has features that may circumvent these problems. pairs build nests in periodic bursts of foam production and egg deposition, three discrete phases being discernible. the first is characterized by a bubble raft without egg deposition and an approximately linear increase in duration of mixing events with time. this phase may reduce initial over-dispersion of foam precursor materials until a critical concentration is achieved. the main building phase is marked by mixing events and start-to-start intervals being nearly constant in duration. during the final phase, mixing events do not change in duration but intervals between them increase in an exponential-like fashion. pairs joining a colonial nesting abbreviate their initial phase, presumably by exploiting a pioneer pair's bubble raft, thereby reducing energy and material expenditure, and time exposed to predators. finally, eggs are deposited only in the centre of nests with a continuously produced, approximately 1 cm deep egg-free cortex that protectively encloses hatched larvae in stranded nests.

What is the strategy?

Túngara frogs protectively enclose hatched larvae by building nests in periodic bursts of foam production and egg deposition on water.

Text: DIFFERENCES IN POLYSACCHARIDE STRUCTURE BETWEEN CALCIFIED AND UNCALCIFIED SEGMENTS IN THE CORALLINE CALLIARTHRON CHEILOSPORIOIDES (CORALLINALES, RHODOPHYTA) 1. the articulated coralline calliarthron cheilosporioides manza produces segmented fronds composed of calcified segments (intergenicula) separated by uncalcified joints (genicula), which allow fronds to bend and reorient under breaking waves in the wave-swept intertidal zone. genicula are formed when calcified cells decalcify and restructure to create flexible tissue. the present study has identified important differences in the main agaran disaccharidic repeating units [\u21923)-\u03b2-d-galp (1\u2192 4)-\u03b1-l-galp(1\u2192] synthesized by genicular and intergenicular segments. based on chemical and spectroscopical analyses, we report that genicular cells from c. cheilosporioides biosynthesize a highly methoxylated galactan at c-6 position with low levels of branching with xylose side stubs on c-6 of the [\u21923)-\u03b2-d-galp (1\u2192] units, whereas intergenicular segments produce xylogalactans with high levels of xylose and low levels of 6-o-methyl \u03b2-d-gal units. these data suggest that, during genicular development, xylosyl branched, 3-linked \u03b2-d-galp units present in the xylogalactan backbones from intergenicular walls are mostly replaced by 6-o-methyl-d-galactose units. we speculate that this structural shift is a consequence of a putative and specific methoxyl transferase that blocks the xylosylation on c-6 of the 3-linked \u03b2-d-galp units. changes in galactan substitutions may contribute to the distinct mechanical properties of genicula and may lend insight into the calcification process in coralline algae.

What is the strategy?

C. cheilosporioides produces segmented fronds composed of calcified segments (intergenicula) separated by uncalcified joints (genicula), which allow fronds to bend and reorient under breaking waves in the wave-swept intertidal zone.

Text: Polarization sensitivity in two species of cuttlefish - Sepia plangon (Gray 1849) and Sepia mestus (Gray 1849) - demonstrated with polarized optomotor stimuli. the existence of polarization sensitivity (ps), most likely resulting from the orthogonal arrangement of microvilli in photoreceptors, has been proposed in cephalopods for some time, although it has rarely been examined behaviourally. here, we tested the mourning cuttlefish, sepia plangon, and the reaper cuttlefish, sepia mestus, for polarization sensitivity using a large-field optomotor stimulus containing polarization contrast. polaroid filter drums with stripes producing alternating e-vectors were rotated around free-moving animals. polarized optomotor responses were displayed, and these responses were similar to those performed in response to a black-and-white, vertically-striped drum, whereas no responses were displayed to a plain polarizing control drum producing just a vertical e-vector. this indicates that the animals are able to see the contrast between adjacent stripes in the polarizing drum. to our knowledge, this is the first demonstration of functional polarization sensitivity in cuttlefish.

What is the strategy?

Polarization sensitivity (PS) is the ability to see the contrast between adjacent stripes in a polarizing drum.

1. Find the strategy of paper, given sentence description of strategy (1-shot)
   1. Find the strategy of the paper. This must include the organism or ecosystem, the part of the organism, what it does or accomplishes, how it does it, and the context in which it completes the function.

Text: Harbor seal vibrissa morphology suppresses vortex-induced vibrations. Harbor seals (Phoca vitulina) often live in dark and turbid waters, where their mystacial vibrissae, or whiskers, play an important role in orientation. Besides detecting and discriminating objects by direct touch, harbor seals use their whiskers to analyze water movements, for example those generated by prey fish or by conspecifics. Even the weak water movements left behind by objects that have passed by earlier can be sensed and followed accurately (hydrodynamic trail following). While scanning the water for these hydrodynamic signals at a swimming speed in the order of meters per second, the seal keeps its long and flexible whiskers in an abducted position, largely perpendicular to the swimming direction. Remarkably, the whiskers of harbor seals possess a specialized undulated surface structure, the function of which was, up to now, unknown. Here, we show that this structure effectively changes the vortex street behind the whiskers and reduces the vibrations that would otherwise be induced by the shedding of vortices from the whiskers (vortex-induced vibrations). Using force measurements, flow measurements and numerical simulations, we find that the dynamic forces on harbor seal whiskers are, by at least an order of magnitude, lower than those on sea lion (Zalophus californianus) whiskers, which do not share the undulated structure. The results are discussed in the light of pinniped sensory biology and potential biomimetic applications.

Strategy: A harbor seal’s whiskers possess an undulated surface structure that reduces vortex-induced vibrations while moving through the water

Text: DIFFERENCES IN POLYSACCHARIDE STRUCTURE BETWEEN CALCIFIED AND UNCALCIFIED SEGMENTS IN THE CORALLINE CALLIARTHRON CHEILOSPORIOIDES (CORALLINALES, RHODOPHYTA) 1. the articulated coralline calliarthron cheilosporioides manza produces segmented fronds composed of calcified segments (intergenicula) separated by uncalcified joints (genicula), which allow fronds to bend and reorient under breaking waves in the wave-swept intertidal zone. genicula are formed when calcified cells decalcify and restructure to create flexible tissue. the present study has identified important differences in the main agaran disaccharidic repeating units [\u21923)-\u03b2-d-galp (1\u2192 4)-\u03b1-l-galp(1\u2192] synthesized by genicular and intergenicular segments. based on chemical and spectroscopical analyses, we report that genicular cells from c. cheilosporioides biosynthesize a highly methoxylated galactan at c-6 position with low levels of branching with xylose side stubs on c-6 of the [\u21923)-\u03b2-d-galp (1\u2192] units, whereas intergenicular segments produce xylogalactans with high levels of xylose and low levels of 6-o-methyl \u03b2-d-gal units. these data suggest that, during genicular development, xylosyl branched, 3-linked \u03b2-d-galp units present in the xylogalactan backbones from intergenicular walls are mostly replaced by 6-o-methyl-d-galactose units. we speculate that this structural shift is a consequence of a putative and specific methoxyl transferase that blocks the xylosylation on c-6 of the 3-linked \u03b2-d-galp units. changes in galactan substitutions may contribute to the distinct mechanical properties of genicula and may lend insight into the calcification process in coralline algae.

Strategy: The coralline calliarthron cheilosporioides produces segmented fronds composed of calcified segments (intergenicula) separated by uncalcified joints (genicula). This study has identified important differences in the main agaran disaccharidic repeating units [\u21923)-\u03b2-d-galp (1\u2192 4)-\u03b1-l-galp(1\u2192] synthesized by genicular and intergenicular segments.

* Missing
  + Function: allow fronds to bend and reorient under breaking waves
  + Context: wave-swept intertidal zone

Text: Polarization sensitivity in two species of cuttlefish - Sepia plangon (Gray 1849) and Sepia mestus (Gray 1849) - demonstrated with polarized optomotor stimuli. the existence of polarization sensitivity (ps), most likely resulting from the orthogonal arrangement of microvilli in photoreceptors, has been proposed in cephalopods for some time, although it has rarely been examined behaviourally. here, we tested the mourning cuttlefish, sepia plangon, and the reaper cuttlefish, sepia mestus, for polarization sensitivity using a large-field optomotor stimulus containing polarization contrast. polaroid filter drums with stripes producing alternating e-vectors were rotated around free-moving animals. polarized optomotor responses were displayed, and these responses were similar to those performed in response to a black-and-white, vertically-striped drum, whereas no responses were displayed to a plain polarizing control drum producing just a vertical e-vector. this indicates that the animals are able to see the contrast between adjacent stripes in the polarizing drum. to our knowledge, this is the first demonstration of functional polarization sensitivity in cuttlefish.

Strategy: The mourning cuttlefish, sepia plangon, and the reaper cuttlefish, sepia mestus, are able to see the contrast between adjacent stripes in a polarizing optomotor stimulus.

* Missing → Part of: microvilli in photoreceptors

1. Just show GPT what you want, without trying to explain (1-shot)
   1. Text: Harbor seal vibrissa morphology suppresses vortex-induced vibrations. Harbor seals (Phoca vitulina) often live in dark and turbid waters, where their mystacial vibrissae, or whiskers, play an important role in orientation. Besides detecting and discriminating objects by direct touch, harbor seals use their whiskers to analyze water movements, for example those generated by prey fish or by conspecifics. Even the weak water movements left behind by objects that have passed by earlier can be sensed and followed accurately (hydrodynamic trail following). While scanning the water for these hydrodynamic signals at a swimming speed in the order of meters per second, the seal keeps its long and flexible whiskers in an abducted position, largely perpendicular to the swimming direction. Remarkably, the whiskers of harbor seals possess a specialized undulated surface structure, the function of which was, up to now, unknown. Here, we show that this structure effectively changes the vortex street behind the whiskers and reduces the vibrations that would otherwise be induced by the shedding of vortices from the whiskers (vortex-induced vibrations). Using force measurements, flow measurements and numerical simulations, we find that the dynamic forces on harbor seal whiskers are, by at least an order of magnitude, lower than those on sea lion (Zalophus californianus) whiskers, which do not share the undulated structure. The results are discussed in the light of pinniped sensory biology and potential biomimetic applications.

Strategy: A harbor seal’s whiskers possess an undulated surface structure that reduces vortex-induced vibrations while moving through the water

Organism: harbor seal

Part of: whiskers

Function: reduces vortex-induced vibrations

Mechanisms: undulated surface structure

Context: moving through water

Text: Building a home from foam-túngara frog foam nest architecture and three-phase construction process. frogs that build foam nests floating on water face the problems of over-dispersion of the secretions used and eggs being dangerously exposed at the foam : air interface. nest construction behaviour of tungara frogs, engystomops pustulosus, has features that may circumvent these problems. pairs build nests in periodic bursts of foam production and egg deposition, three discrete phases being discernible. the first is characterized by a bubble raft without egg deposition and an approximately linear increase in duration of mixing events with time. this phase may reduce initial over-dispersion of foam precursor materials until a critical concentration is achieved. the main building phase is marked by mixing events and start-to-start intervals being nearly constant in duration. during the final phase, mixing events do not change in duration but intervals between them increase in an exponential-like fashion. pairs joining a colonial nesting abbreviate their initial phase, presumably by exploiting a pioneer pair's bubble raft, thereby reducing energy and material expenditure, and time exposed to predators. finally, eggs are deposited only in the centre of nests with a continuously produced, approximately 1 cm deep egg-free cortex that protectively encloses hatched larvae in stranded nests.

Strategy: Túngara frogs protectively enclose hatched larvae by building nests in periodic bursts of foam production and egg deposition on water.

Organism: Túngara frog

Part of: nest

Function: protectively encloses hatched larvae

Mechanisms: building nests

Context: periodic bursts of foam production on water

Text: DIFFERENCES IN POLYSACCHARIDE STRUCTURE BETWEEN CALCIFIED AND UNCALCIFIED SEGMENTS IN THE CORALLINE CALLIARTHRON CHEILOSPORIOIDES (CORALLINALES, RHODOPHYTA) 1. the articulated coralline calliarthron cheilosporioides manza produces segmented fronds composed of calcified segments (intergenicula) separated by uncalcified joints (genicula), which allow fronds to bend and reorient under breaking waves in the wave-swept intertidal zone. genicula are formed when calcified cells decalcify and restructure to create flexible tissue. the present study has identified important differences in the main agaran disaccharidic repeating units [\u21923)-\u03b2-d-galp (1\u2192 4)-\u03b1-l-galp(1\u2192] synthesized by genicular and intergenicular segments. based on chemical and spectroscopical analyses, we report that genicular cells from c. cheilosporioides biosynthesize a highly methoxylated galactan at c-6 position with low levels of branching with xylose side stubs on c-6 of the [\u21923)-\u03b2-d-galp (1\u2192] units, whereas intergenicular segments produce xylogalactans with high levels of xylose and low levels of 6-o-methyl \u03b2-d-gal units. these data suggest that, during genicular development, xylosyl branched, 3-linked \u03b2-d-galp units present in the xylogalactan backbones from intergenicular walls are mostly replaced by 6-o-methyl-d-galactose units. we speculate that this structural shift is a consequence of a putative and specific methoxyl transferase that blocks the xylosylation on c-6 of the 3-linked \u03b2-d-galp units. changes in galactan substitutions may contribute to the distinct mechanical properties of genicula and may lend insight into the calcification process in coralline algae.

Strategy: The articulated coralline Calliarthron cheilosporioides produces segmented fronds composed of calcified segments (intergenicula) separated by uncalcified joints (genicula), which allow fronds to bend and reorient under breaking waves in the wave-swept intertidal zone.

Organism: coralline algae

Part of: fronds

Function: allow fronds to bend and reorient

Mechanisms: segmentation

Context: wave-swept intertidal zone

Text: Polarization sensitivity in two species of cuttlefish - Sepia plangon (Gray 1849) and Sepia mestus (Gray 1849) - demonstrated with polarized optomotor stimuli. the existence of polarization sensitivity (ps), most likely resulting from the orthogonal arrangement of microvilli in photoreceptors, has been proposed in cephalopods for some time, although it has rarely been examined behaviourally. here, we tested the mourning cuttlefish, sepia plangon, and the reaper cuttlefish, sepia mestus, for polarization sensitivity using a large-field optomotor stimulus containing polarization contrast. polaroid filter drums with stripes producing alternating e-vectors were rotated around free-moving animals. polarized optomotor responses were displayed, and these responses were similar to those performed in response to a black-and-white, vertically-striped drum, whereas no responses were displayed to a plain polarizing control drum producing just a vertical e-vector. this indicates that the animals are able to see the contrast between adjacent stripes in the polarizing drum. to our knowledge, this is the first demonstration of functional polarization sensitivity in cuttlefish.

Strategy: Cuttlefish are able to see the contrast between adjacent stripes in a polarizing optomotor stimulus.

Organism: cuttlefish

Part of: eyes

Function: see contrast

Mechanisms: polarization sensitivity → where is it in the strategy?

Context: optomotor stimulus

Identification and characterization of a multidomain hyperthermophilic cellulase from an archaeal enrichment. archaea are microorganisms that use a wide range of carbon and energy sources. graham et al. describe an archaeal consortium that can grow at temperatures above 90 \u00b0c using crystalline cellulose as a carbon source, with potential applications in enzymatic degradation under extreme conditions.

Strategy: An archaeal consortium that can grow at temperatures above 90 \u00b0C using crystalline cellulose as a carbon source.

Organism: archaea

Part of: cellulase

Function: degrade cellulose

Mechanisms: extreme conditions

Context: crystalline cellulose

1. What is the biological strategy? (Pt.2 Mention organism, part of, etc. before forming the strategy, Added some lines to original prompt) (1-shot)
   1. A biological strategy is a characteristic, mechanism, or process that an organism or ecosystem exhibits to accomplish a particular function within a particular context.

The main elements of a biological strategy are:

- The organism or ecosystem

- The part of the organism

- Function (what it does or accomplishes)

- Mechanisms (how it does it)

- Context (environment, conditions, constraints, stressors)

Make sure the biological strategy has the organism, the part of the organism, Function, Mechanism, and Context within it.

Make sure the biological strategy is accurate, high-quality, written by an expert, and can be understood by a high school student.

Text: Harbor seal vibrissa morphology suppresses vortex-induced vibrations. Harbor seals (Phoca vitulina) often live in dark and turbid waters, where their mystacial vibrissae, or whiskers, play an important role in orientation. Besides detecting and discriminating objects by direct touch, harbor seals use their whiskers to analyze water movements, for example those generated by prey fish or by conspecifics. Even the weak water movements left behind by objects that have passed by earlier can be sensed and followed accurately (hydrodynamic trail following). While scanning the water for these hydrodynamic signals at a swimming speed in the order of meters per second, the seal keeps its long and flexible whiskers in an abducted position, largely perpendicular to the swimming direction. Remarkably, the whiskers of harbor seals possess a specialized undulated surface structure, the function of which was, up to now, unknown. Here, we show that this structure effectively changes the vortex street behind the whiskers and reduces the vibrations that would otherwise be induced by the shedding of vortices from the whiskers (vortex-induced vibrations). Using force measurements, flow measurements and numerical simulations, we find that the dynamic forces on harbor seal whiskers are, by at least an order of magnitude, lower than those on sea lion (Zalophus californianus) whiskers, which do not share the undulated structure. The results are discussed in the light of pinniped sensory biology and potential biomimetic applications.

Organism: harbor seal

Part of: whiskers

Function: reduces vortex-induced vibrations

Mechanisms: undulated surface structure

Context: moving through water

Biological Strategy: A harbor seal’s whiskers possess an undulated surface structure that reduces vortex-induced vibrations while moving through the water

Text: Building a home from foam-túngara frog foam nest architecture and three-phase construction process. frogs that build foam nests floating on water face the problems of over-dispersion of the secretions used and eggs being dangerously exposed at the foam : air interface. nest construction behaviour of tungara frogs, engystomops pustulosus, has features that may circumvent these problems. pairs build nests in periodic bursts of foam production and egg deposition, three discrete phases being discernible. the first is characterized by a bubble raft without egg deposition and an approximately linear increase in duration of mixing events with time. this phase may reduce initial over-dispersion of foam precursor materials until a critical concentration is achieved. the main building phase is marked by mixing events and start-to-start intervals being nearly constant in duration. during the final phase, mixing events do not change in duration but intervals between them increase in an exponential-like fashion. pairs joining a colonial nesting abbreviate their initial phase, presumably by exploiting a pioneer pair's bubble raft, thereby reducing energy and material expenditure, and time exposed to predators. finally, eggs are deposited only in the centre of nests with a continuously produced, approximately 1 cm deep egg-free cortex that protectively encloses hatched larvae in stranded nests.

Organism: túngara frog

Part of: foam nest

Function: protectively encloses hatched larvae

Mechanisms: three-phase construction process

Context: nesting

Biological Strategy: The túngara frog builds a foam nest with a three-phase construction process that protectively encloses hatched larvae.

1. Find the Claim
2. Find the Biological claim
3. Given a text, find the Organism or ecosystem, the Part of the organism used in the strategy, the Function of the strategy (what it does or accomplishes), the Mechanisms of the strategy (how it does it), and the Context of the Organism (environment, conditions, constraints, stressors).

Then create a Biological Strategy from the above information.

Make sure the Context is in the Biological Strategy. Make sure the Organism or ecosystem is in the Biological Strategy. …