



# Hyperintensionality and Impossible Worlds: An Introduction

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# One Guiding Idea

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Intensionality :: Possible Worlds

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Hyperintensionality :: Impossible Worlds

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# Extension

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- The extension of a singular term is its referent
    - Extension of 'Barack Obama' is Barack Obama
  - The extension of a general term is a class
    - Extension of 'philosopher' is the class of philosophers
  - The extension of a predicate is a class or a property
    - Extension of 'red' is the class of red things, or the property of redness.
  - And so on.
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# Extensionality

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- Extensionality theses:
  - Extensional meaning: The meaning of an expression is its extension.
    - Meaning of 'Barack Obama' is Barack Obama
  - Extensional compositionality: The truth-value of a sentence is determined by the extensions of its parts.
    - 'Barack Obama is George Bush' : true iff the extension of 'Barack Obama' is the extension of 'George Bush'
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# Intensionality

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- Challenges to extensionality theses:
  - Intensional Meaning: Coextensive expressions have intuitively different meanings, with different cognitive significance
    - ‘The Morning Star’, ‘The Evening Star’
    - Frege: ‘The MS is the ES’ is cognitively significant
  - Intensional Compositionality: Substituting coextensive expressions can change truth-value
    - ‘It is possible that the MS is not the ES’ : true
    - ‘It is possible that the ES is not the ES’ : false
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- ‘It is possible that...’ is an *intensional context*.

# Strategy 1: Intensions

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- Strategy 1: Meaning isn't an extension but an intension
  - Carnap: The *intension* of an expression is a function from possible worlds to extensions
    - Intension of 'the morning star' picks out the morning star in all worlds
  - 'The morning star' and 'The evening star' have same extension, different intension
  - Truth-value of a sentence (with an intensional context) is determined by the intensions of its parts
    - 'It is possible that the MS isn't the ES' is true because there's a world where the intension of 'the MS isn't the ES' is true.
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# Strategy 2: Structure

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- Strategy 2: Appeal to internal structure in these expressions
  - E.g. Russell: ‘the morning star is F’ is equivalent to ‘there exists a unique star visible in the morning and it is F’
    - Then ‘the morning star’ and ‘the evening star’ will be associated with different structures
    - The truth-value of a sentence may still be determined by the extensions of its parts.
  - No need for possible worlds and intensions: structure plus extension can do the work.
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# Strategy 3: Denial

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- Strategy 3: Deny the difference in meaning
  - E.g. Kripke (for names, although not descriptions)
    - ‘Hesperus’ and ‘Phosphorus’ have the same meaning
    - ‘It is possible that Hesperus is not Phosphorus’ is false.
    - The cognitive difference is not a difference in meaning.
  - So again, extension (plus structure) does the job.
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# Hyperintensionality

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- Hyperintensional Meaning: Cointensive expressions (necessarily equivalent, same intension) have intuitively different meanings.
    - ‘Hesperus’, ‘Phosphorus’ (post-Kripke)
    - ‘77+44’, ‘121’
  - Hyperintensional Composition: Substituting cointensive expressions can change truth-values
    - ‘It is a priori that  $H=H$ ’ vs ‘It is a priori that  $H=P$ ’
    - ‘John believes that  $77+44=121$ ’ vs ‘John believes that  $121=121$ ’
  - ‘It is a priori that...’, ‘John believes that...’ are *hyperintensional contexts*
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# Weak and Strong Hyperintensionality

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- Say that two expressions are weakly cointensive if they are necessarily equivalent but not a priori equivalent
    - E.g. 'Hesperus' and 'Phosphorus' 'Water' and 'H<sub>2</sub>O'
  - Two expressions are strongly cointensive if they are necessarily equivalent and a priori equivalent
    - E.g. '77+44' and '121', 'A or B' and 'not(not-A and not-B)' .
  - These yield corresponding phenomena
    - weak hyperintensionality: difference in meaning/composition between weakly cointensive expressions
    - strong hyperintensionality: difference in meaning/composition between strongly cointensive expressions
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# Weak Hyperintensionality

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- Weakly hyperintensional cognitive significance
    - ‘Hesperus = Phosphorus’ is cognitively significant
    - ‘Water = H<sub>2</sub>O’
  - Weakly hyperintensional failures of intensional compositionality
    - ‘It is a priori that Hesperus is Phosphorus’
    - ‘It is a priori that water is H<sub>2</sub>O’
  - ‘It is a priori that...’ is a weakly hyperintensional context (although not a strongly hyperintensional context).
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# Strategy 1: Impossible Worlds

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- Strategy 1: Introduce “impossible” worlds where water is not H<sub>2</sub>O, where Hesperus is not Phosphorus, and so on.
  - This is the strategy of “two-space” two-dimensionalism: a space of epistemically possible worlds (scenarios), and a distinct space of metaphysically possible worlds.
  - ‘Water is H<sub>2</sub>O’ is true at all metaphysically possible worlds, but false at some epistemically possible worlds
    - ‘Water’ and ‘H<sub>2</sub>O’ have different *epistemic intensions*
    - ‘It is a priori that...’ operates on epistemic intensions.
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# Strategy 2: Reinterpret Possible Worlds

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- Strategy 2: Find a new way of evaluating sentences at possible worlds so that ‘Water is H<sub>2</sub>O’ and ‘Hesperus is Phosphorus’ are false (under this evaluation) at some possible worlds.
  - This is the strategy of “one-space” two-dimensionalism: a single space of possible worlds (with or without centers), where sentences are associated with two different intensions over these worlds.
  - The secondary intension of ‘Water is H<sub>2</sub>O’ is true at all possible worlds, but the primary intension is false at some possible worlds.
    - ‘Water’ and ‘H<sub>2</sub>O’ have different primary intensions
    - ‘It is a priori that...’ operates on primary intensions.
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# Strategy 3: Appeal to Structure

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- Strategy 3: Find some relevant difference in the internal structure of (the logical form of) 'Hesperus' and 'Phosphorus', or 'water' and 'H<sub>2</sub>O'.
- E.g. the descriptivist about names:
  - 'Hesperus' = 'the morning star', 'Phosphorus' = 'the evening star'

# Strategy 4: Denial

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- Strategy 4: Deny that there is any weak hyperintensionality of meaning (cf. direct reference theorists)
  - The difference in cognitive significance between ‘Hesperus’ and ‘Phosphorus’ is not a semantic difference
  - ‘It is a priori that...’ is not a weakly hyperintensional context
    - E.g. ‘It is a priori that Hesperus is Phosphorus’ is true.
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# Strong Hyperintensionality

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- Strongly hyperintensional cognitive significance
    - '44+77 = 121' is cognitively significant (although a priori)
    - '(A or B) iff (not(not-A and not-B))' is cognitively significant (although a priori)
  - Strongly hyperintensional failures of intensional compositionality
    - 'John believes that 121=121'
    - 'John believes that 44+77=121'
  - N.B. Two-dimensionalism alone doesn't help here, as a priori equivalent expressions have the same primary/epistemic intensions
  - 'John believes that...' is a strongly hyperintensional context.
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# Strategy 1: Impossible Worlds

- Natural suggestion: There are impossible worlds (or scenarios) where
  - '44+77=121' is false
  - '(A or B) iff (not(not-A and not-B))' is false
- Expressions can be associated with *hyperintensions*: functions from possible and impossible worlds to extensions.
  - '44+77' and '121' have the same intension, the same primary/epistemic intension, but different hyperintensions.
  - A priori truths are cognitively significant because they have nontrivial hyperintensions?
  - Strongly hyperintensional operators such as 'John believes that' operate on hyperintensions.
- Strongly hyperintensional cognitive significance
  - '44+77 = 121' is cognitively significant (although a priori)
  - '(A or B) iff (not(not-A and not-B))' is cognitively significant (although a priori)

# What are Impossible Worlds

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- Q: What are impossible worlds? How can we construct them?
  - Possible worlds: maximal compossible sets of sentences
  - (Ideal) epistemically possible scenarios: maximal a priori consistent sets of sentences.
  - How do we relax this for non-ideal epistemically possible scenarios?
  - See Bjerring, Brogaard/Salerno, Jago, Schaffer, ...
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# 1. Anything-Goes Worlds

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- One avenue: There are no substantive constraints on impossible worlds. E.g. there are possible worlds where arbitrary contradictions are true.
    - E.g. Priest's open worlds, which are arbitrary sets of sentences.
    - A sentence is true at an open world if it is in the set.
  - Problem: The hyperintension of every sentence will be trivial
    - It will be the set of sets of sentences that contain S
    - These hyperintensions are insensitive to meaning of S
    - So they have no more structure/info than sentences
    - So hyperintensions over open worlds aren't a useful notion of meaning
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# 2. Nontrivial Impossible Worlds

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- Another avenue: There are substantive constraints on impossible worlds. E.g. trivially false contradictions are ruled out.
  - Bjerring: start with a non-normal but nontrivial modal operator
    - E.g. provable-in-n-steps (a stratified set of operators)
    - Use this to construct a space of worlds (stratified spaces of worlds)
  - Problem: Depending on how the construction works, it threatens to yield either
    - too many worlds (almost-anything-goes worlds); or
    - not enough worlds (no worlds where logical truths are false)
  - The worry seems to arise for most versions of nontrivial impossible worlds.
  - Bjerring's challenge: find a construction that avoids this dilemma.
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# Strategy 2: Reinterpret Possible Worlds

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- Strategy 2: Find a new way of evaluating sentences at possible worlds so that 'Water is H<sub>2</sub>O' and 'Hesperus is Phosphorus' are false (under this evaluation) at some possible worlds.
  - E.g. Stalnaker: the diagonal proposition of 'Water is H<sub>2</sub>O' is the set of worlds where 'water is H<sub>2</sub>O' (as uttered in that world) is true
    - False at some worlds, where language is different
  - So 'water' and 'H<sub>2</sub>O' have different diagonal intensions.
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# Problems

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- Problems for Stalnaker's metalinguistic strategy
    - Diagonal intensions ignore meaning and have no more interesting structure than sentences
    - They treat nontrivial impossibilities and trivial impossibilities just the same.
    - They don't seem to capture what we are entertaining when we wonder about the truth of some mathematical theorem
  - Q: Any other version of a reinterpreting-possible-worlds strategy? (Schwarz?)
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# Strategy 3: Appeal to Structure

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- Strategy 3: Find internal structure in strongly cointensive expressions: e.g. '44+77' and '121' have different structure
    - Represent these as structured intensions (Cresswell).
  - 2D version of this strategy: sentences are associated with *structured primary intensions* (or: enriched intensions)
    - E.g. 'Hesperus is Hesperus', 'Hesperus is Phosphorus': same structure, different basic intensions
    - '44+77', '121': different structures
  - One can argue that something like these structured intensions yield an adequate treatment of attitude ascriptions and other strongly hyperintensional contexts.
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# Problem

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- Problem: This will only work if there are no pairs of *simple* expressions with the same (primary) intension but cognitive/compositional differences.
    - If there are, then structure won't help.
  - Are there? Not obvious.
    - Maybe the best case involve fiction/legend names with primary intensions that have no referent at any scenario.
  - Also: Even if this works, it would be very nice to have impossible worlds for various explanatory purposes, e.g. the analysis of epistemic possibility.
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# Strategy 4: Denial

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- Strategy 4: Denial of strong hyperintensionality
    - Strongly hyperintensional differences in cognitive significance are psychological differences, not semantic differences
    - There are no strongly hyperintensional contexts (so ‘Lois knows that Superman is Clark Kent’ is true).
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# Strategy 5: Inferentialism

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- Strategy 5: There is a semantic difference between strongly cointensive expressions, but this isn't best represented using intensions and extensions.
  - Instead, it's a difference in inferential role (Restall)

# Strategy 6: Properties of Expressions

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- Strategy 6: There is a difference between strongly cointensive expressions, but this isn't best represented using intensions and extensions.
    - Instead, it's a difference in "properties of expressions" (Bigelow)
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# Other Perspectives

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- One can also approach these issues from the perspective of
    - Modal logic (Kripke-style semantics for non-normal modal operators)
    - Epistemology and epistemic logic (Hintikka-style analysis of non-ideal epistemic possibility)
    - Philosophy of mind/cognition (making sense of rational processes in non-ideal agents)
    - Metaphysics (analyzing the coherence and nature of impossible worlds)
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# Onward

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- Onward into the impossible...
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