The Foundations of Two-Dimensional Semantics

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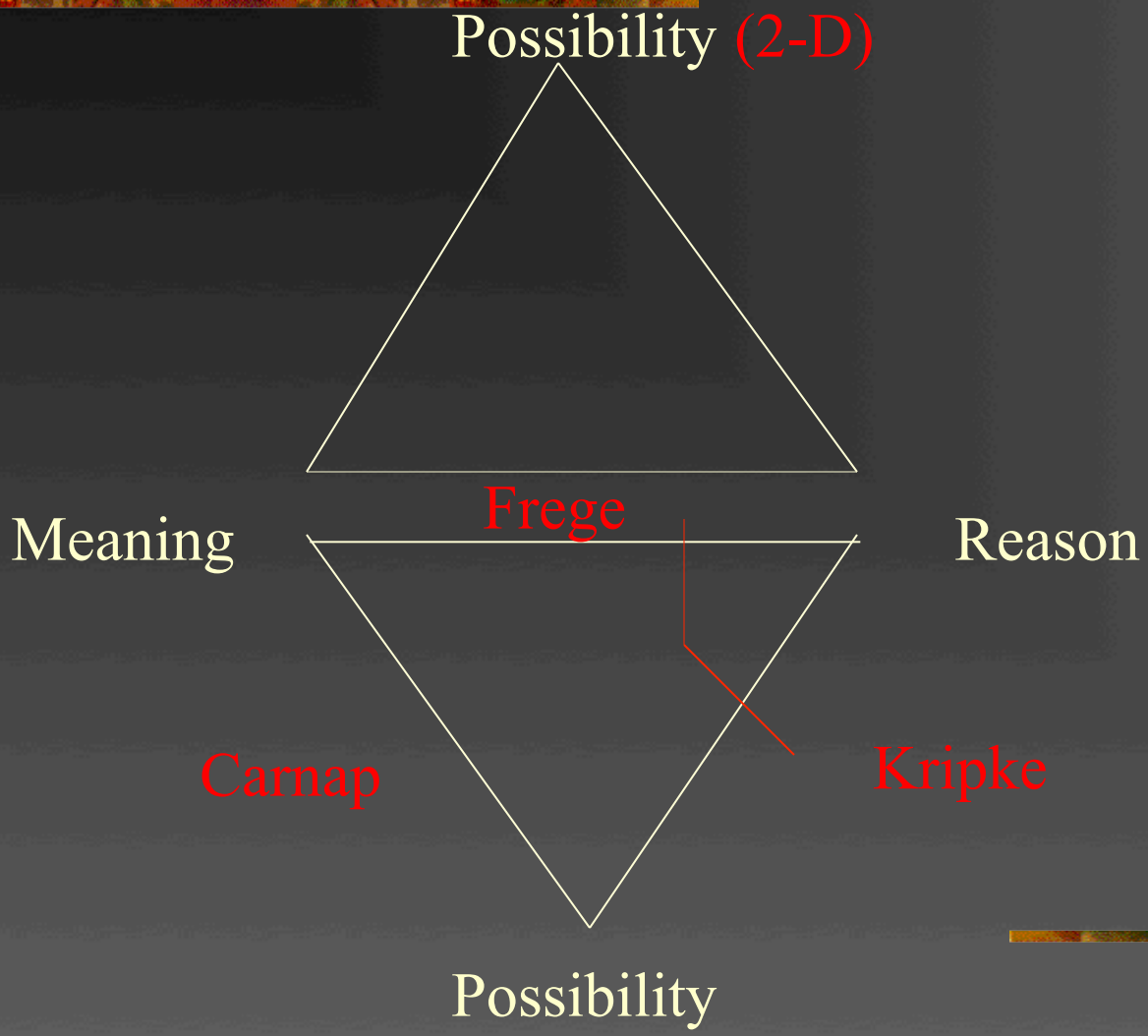
Meaning, Reason, Possibility



Frege on Sense

- Frege: the extension of an expression does not determine its cognitive significance
  - ‘Hesperus’ vs ‘Phosporus’ ‘water’ vs. ‘H2O’
  - `renate’ vs ‘cordate’ ‘I’ vs. ‘David Chalmers’
- We need an aspect of meaning that is tied constitutively to cognitive significance: sense.
- Fregean Thesis: ‘A’ and ‘B’ have the same sense iff ‘A=B is cognitively significant.

Carnap on Intension

- Carnap: Expressions have intensions, capturing their extensions across possible tates of affairs.
  - Intension = function from possibilities to extensions
- Co-extensive expressions can have different intensions
  - E.g. ‘renate’, ‘cordate’
- Carnapian Thesis: ‘A’, ‘B’ have the same intension iff ‘A=B’ is necessary.
- Hope: intension can play the role of sense.

Carnap + Kant = Frege

- Carnapian Thesis: ‘A’, ‘B’ have the same intension iff ‘A=B’ is necessary.

plus

- Kantian Thesis: P is necessary iff P is a priori

yields

- Neo-Fregean Thesis: ‘A’, ‘B’ have the same intension iff ‘A=B’ is a priori.

Kripke

- Kripkean Thesis: P is necessary <-|-> P is a priori.
  - Nec(water=H2O) ~Apriori(water=H2O)
  - ~Nec(Hesperus=evening star) Apriori(Hesperus=evening star)
  - Nec (I am David Chalmers) ~Apriori (I am David Chalmers)
- Denies Kantian thesis and so denies Neo-Fregean Thesis (Carnapian thesis is retained)
- Names, natural kind terms, indexicals are rigid designators
  - Pick out actual extension at all possibilities
  - Co-extensive names (etc) have the same intension
- So: intension does not track cognitive/rational significance

Two-Dimensional Semantics

- Core idea of 2-D semantics: There are two sorts of dependence of extension on possible states of the world, and so two sorts of intension.

- First dimension: Extension in possibilities considered as actual (‘context of utterance’)
- Second dimension: Extension in possibilities considered as counterfactual (‘circumstance of evaluation’)

- The second (more familiar) yields the Kripkean gap between intension and cognitive significance.
- The first (less familiar) supports a closer tie between intension and cognitive significance?

Examples

- E.g. ‘I’
  - 2-intension picks out DJC in all worlds
  - 1-intension picks out speaker/center in all worlds
  - ‘I’ and ‘DJC’ have same 2-intension, different 1-intension
- E.g. ‘Hesperus’
  - 2-intension picks out Venus in all worlds
  - 1-intension picks out evening star in all/many worlds
  - ‘Hesperus’ & ‘Phosphorus’ have same 2-intension, different 1-intension
- E.g. ‘water’
  - 2-intension picks out H2O in all worlds (Earth, Twin Earth)
  - 1-intension picks out H2O in Earth, XYZ in Twin Earth
  - ‘water’ & ‘H2O’ have same 2-intension, different 1-intension

Two-Dimensional Frameworks

- Various different 2-D frameworks have been developed, with different but related properties.
  - Kaplan: character & content
  - Stalnaker: diagonal proposition & propositional content
  - Evans: deep necessity & superficial necessity
  - Davies/Humberstone: "fixedly actual" truth vs. necessary truth
  - Chalmers: primary intension & secondary intension
  - Jackson: A-intension & C-intension

- Q: What is the relation between these?
- Q: What are the fundamental underlying notions?

Two-Dimensionalist Claims

- Motivation of 2-D semantics: The first dimension promises to better capture an expression's cognitive/rational significance
  - Rational equivalence and apriority is better reflected in 1-intension than in 2-intension
- But different two-dimensionalists make claims of different strength
  - Kaplan: link is limited to indexicals, demonstratives
  - Stalnaker: no strong link to apriority
  - Evans, D&H: limited to descriptive names
  - Chalmers, Jackson: claim a much stronger link
- These different claims arise from different *understandings* (or *interpretations*) of two-dimensional semantics. Sort these out?

Intensions and Apriority

- Q: Can a two-dimensional framework yield a notion of meaning tied *constitutively* to reason and possibility?
- Ideal: ‘A’ and ‘B’ have same 1-intension iff ‘A=B’ is a priori.
- Core Thesis: S is a priori iff S has a necessary 1-intension
- Q: Can we define 1-intensions satisfying the core thesis?

Why Care?

- Why care about whether there are intensions satisfying the core thesis?

- (1) Fregean sense.
- (2) Narrow content.
- (3) Conceivability-possibility link.
- (4) Semantic of belief ascriptions and indicative conditionals.
- …..

Interpreting 2-D Semantics

- Key idea: There are two quite different understandings of two-dimensional semantics: the contextual understanding and the epistemic understanding.
- The contextual understanding uses the first dimension to capture context-dependence.
- The epistemic understanding uses the first dimension to capture epistemic dependence.
- The contextual understanding (more familiar) is not constitutively tied to the epistemic domain. The epistemic understanding (less familiar) is constitutively tied to the epistemic domain.

The Contextual Understanding

- On the contextual understanding, the first-dimensional possibilities at which an expression is evaluated in the first dimension represent possible contexts of utterance.

- Starting points:
  - (1) any expression token has a (possibly null) extension.
  - (2) expression tokens fall under expression types (orthographic, linguistic, semantic, …)
  - (3) different tokens of a single expression type can have different extensions
  - (4) this variation depends on the context in which the expression token is embedded
  - (5) contexts can be represented as centered worlds: centered on the token, or on a (subject, time) uttering the token.

Contextual Intensions (Types)

- The contextual intension of an expression type is a function from centered worlds to extensions
  - defined at worlds centered on (a subject uttering) a token of that expression type
  - returning the extension of the expression token at the center
- Ultimately defined by a metalinguistic subjunctive: if a token of the type were uttered in such-and-such context, what would its extension be?

Contextual Intensions (Tokens)

- The contextual intension of an expression token (relative to a type of which it is a token) is a function from centered worlds to extensions
  - defined at worlds centered on a token of the same type
  - returns the extension of the token at the center
  - Same as: the contextual intension of the corresponding expression type.

- There are different sorts of contextual intensions for different ways of typing expression tokens: orthographic, semantic, linguistic, …

Orthographic Contextual Intensions II

- The orthographic contextual intension of a sentence token is much like its diagonal proposition as defined by Stalnaker.

- Orthographic contextual intensions do not satisfy the core thesis:
  - For every orthographic type, some possible token of that type expresses a falsehood
    - e.g. 'bachelors are unmarried' is false in a context in which the string means that horses are cows
  - So every expression (even a priori expressions) will have a contingent orthographic contextual intension

Linguistic Contextual Intensions

- Linguistic types: Two expression tokens are tokens of the same linguistic type when they are tokens of the same linguistic expression (i.e. expression in a language).

- The linguistic contextual intension of an expression token maps worlds centered on tokens of the same linguistic type to the extension of the relevant token.

- E.g. 'water is H2O' (in English)
  - W1 (Earth) -> true
  - arguably: not defined at W2 (Twin Earth)
  - not defined at W3 (New Earth)
  - arguably: true at all worlds at which it is defined.

Orthographic Contextual Intensions

- Orthographic types: Two tokens are tokens of the same orthographic type when they have the same orthography (regardless of meaning, language)
- The orthographic contextual intension of an expression token maps worlds centered on tokens of the same orthographic type to the extension of that token.
- E.g. ‘water is H2O’ :
  - W1 (centered on Earth, Oscar) -> true
  - W2 (centered on Twin Earth, Twin Oscar) -> false
  - W3 (centered on New Earth, 'water' means steel) -> false

Linguistic Contextual Intensions II

- The linguistic contextual intensions of an expression resembles (but is not identical to) its character as defined by Kaplan
  - Minor differences: we have to (i) diagonalize character, (ii) use Kaplan's special linguistic typing for demonstratives, (iii) set aside 'occurrences' in which context doesn't contain the token.

- Linguistic contextual intensions do not satisfy the core thesis
  - 'water is H2O', 'Cicero is Tully': a posteriori, but (arguably) necessary linguistic contextual intension
  - Works best for indexicals & certain descriptions, and demonstratives under Kaplanian individuation
  - Doesn't work for expressions (e.g. names) that have their extension essentially

Semantic Contextual Intensions

- Semantic types: Two expression tokens are tokens of the same semantic type when they have the same semantic value.
  - Many different sorts of semantic type, corresponding to different methods of assigning semantic values (and different notions of meaning/content).
- The semantic contextual intension of a token maps a world centered on a token of the same semantic type to the extension of that token.
- E.g. 'water is H2O' (in English)
  - W1 -> true
  - (arguably) not defined at W2, W3 (depending on semantic valuation)
  - W4 (centered on French speaker, 'eau est H2O') -> true.

Semantic Contextual Intensions II

- If semantic value = linguistic meaning
  - semantic contextual intension is an extension of its linguistic contextual intension (extended across synonymy and translation),
  - core thesis will be false for similar reasons.

- If semantic value = Fregean/descriptive content
  - Core thesis may be more plausible:
  - ‘water’ may have same semantic value on W1, W2, but not W3
  - ‘water is H2O’ will have contingent intension; a priori statements will have necessary intensions

- But: these contextual intensions will depend on an account of a Fregean semantic value, and so cannot ground such an account

A Further Problem

- Further problem for the core thesis:
  - `language exists'
  - `words exist'
  - "`word' is a word"
- All of these are a posteriori
  - But all have necessary contextual intensions, for any sort of semantic or linguistic expression typing.
- So no semantic or linguistic contextual intension will satisfy the core thesis.

Contextual Intensions (Misc.)

- Hybrid contextual intensions: defined for conjunctive expression types, e.g. orthographic/semantic
- Presemantic contextual intensions: defined across tokens that share a presemantic type. E.g.
  - produced by physically identical subjects;
  - associated with same intentions, or same cognitive role, or …
- Extended contextual intensions: defined in centered worlds that do not contain a token of the relevant type, counterfactually:
  - Rule: what would be the extension of an expression of the relevant type, if it were used at the center of this world.
  - Arguably ill-defined (it is not clear how to evaluate the counterfactual)
- Some of these arguably help with some problems, but others (e.g. `language exists') still arise.

Contextual Intensions (Overall)

- Overall: no contextual intension can satisfy core thesis
- Basic problem: contextual intensions are not defined in epistemic terms, and so lack a constitutive connection to the epistemic
  - In some cases (e.g. LCI for indexicals), a close tie emerges, but these cases are exceptional and not generalizable
- To satisfy the Core Thesis, 1-intensions must be defined in epistemic terms.

The Epistemic Understanding

- On the epistemic understanding, the first-dimensional possibilities at which an expression is evaluated in the first dimension represent epistemic possibilities (in a broad sense)
- The epistemic intension of an expression represents the distinctive way it is used to describe and evaluate epistemic possibilities
- Epistemic intensions capture the epistemic dependence of an expression's extension on the state of the world

Deep Epistemic Possibility

- Say that S is (deeply) epistemically necessary when S is a priori.
- S is (deeply) epistemically possible when ~S is not epistemically necessary
- Epistemically possible (in this sense):
  - 'Water is XYZ' 'Hesperus is not Phosphorus'
- Not epistemically possible (in this sense):
  - 'Bachelors are married' 'Hesperus was never visible'.
- Deep epistemic possibilities represent, intuitively, coherent ways the actual world might be (coherent hypotheses about the actual world).

Maximal Epistemic Possibilities

- Intensions operate over an epistemic space of maximal epistemic possibilities, or scenarios.
- Scenarios stand to deep epistemic possibility as worlds stand to metaphysical possibility
- Q: How to understand scenarios?

Worlds as Epistemic Possibilities

- For any (metaphysically possible) world W: it is epistemically possible that W is actual
  - E,g, it is epistemically possible that the XYZ-world is actual
  - It is epistemically possible that the H2O-world is actual.
  - Strictly: D is epistemically possible, where D is a canonical description of W.
- Worlds represent highly specific epistemic possibilities
- Arguably: worlds represent maximal epistemic possibilities, and every maximal epistemic possibility is represented by a world.

Epistemic Dependence

- We use language to evaluate epistemic possibilities, and to evaluate worlds considered as epistemic possibilities
- E.g. XYZ-world (as epistemic possibility) -> water is XYZ
  - Intuitively: the epistemic possibility that the XYZ-world is actual is an instance of the epistemic possibility that water is XYZ.
  - Indicatively: if the XYZ-world is actual, then water is XYZ.
  - Turning-out: if it turns out that the XYZ-world is actual, it will turn out that water is XYZ.
  - Ramsey Test: If I hypothetically accept that the XYZ-world is actual, I reach the hypothetical conclusion that water is XYZ.
- This epistemic dependence extension on state of the world can be formalized as an epistemic intension.

Epistemic Intensions

- For sentences: Epistemic intension is a function from scenarios to truth-values.
  - The epistemic intension of S is true at W iff W verifies S.
  - Q: What is it for a scenario W to verify a sentence S?

- Informally: W verifies S iff the epistemic possibility that W is actual is an instance of the epistemic possibility that S.

- Formally: W verifies S iff D epistemically necessitates S, where D is a canonical description of W.

- Need to clarify: scenarios, canonical descriptions, epistemic necessitation.

Scenarios I: Worlds

- Option 1: Scenarios (maximal epistemic possibilities) = centered (metaphysically) possible worlds
- Need centered worlds (with marked subject, time, …) to handle epistemic incompleteness of objective descriptions, due to indexicality
- Kripkean phenomena are no problem
  - E.g. `water is XYZ' is epistemically possible, and is verified by the metaphysically possible XYZ-world
  - N.B. W can verify S without satisfying S, so metaphysically impossible statements can be verified by metaphysically possible worlds.
- Every centered world plausibly represents a maximal epistemic possibility (under a canonical description, restricted to semantically neutral terms and indexicals).

Scenarios II: Obstacle

- Obstacle: On some (controversial) philosophical views, there are epistemic possibilities that no metaphysically possible world verifies:
  - Some theists: "No god exists"
  - Type-B materialist: "Zombies exist".
  - Some mathematical hyper-realists: Continuum Hypothesis (or some such)
- If so: there are more maximal epistemic possibilities than metaphysically possible centered worlds, and the core thesis is false.
- I hold: these views are false, and there is a metaphysical possible world for every maximal epistemic possibility
  - See "Does Conceivability Entail Possibility?"
- Still: it would be useful to have a purely epistemic notion that doesn't rest on this substantive claim about metaphysical possibility.

Scenarios III: Epistemic Space

- Option 2: Define maximal epistemic possibilities in epistemic terms
  - Either as a primitive notion
  - Or as an "ersatz" construction from sentences/propositions/beliefs.
- E.g. D is epistemically complete when
  - D is epistemically possible
  - There is no S such that D&S, D&~S are both epistemically possible
- Then: identify scenarios with equivalence classes of epistemically complete sentences in an expressively complete language.
  - See "The Nature of Epistemic Space" for a version of this.
- Link to epistemic realm is guaranteed; link to metaphysical possibility is a substantive issue.

Epistemic Necessitation

- W verifies S when D (canonical description) epistemically necessitates S.
- Informal test (indicative): If D is the case, is S the case?
- Formally: D epistemically necessitates S when D&~S is epistemically impossible
  - If epistemic possibility is defined in terms of apriority, then epistemic necessitation is a priori entailment.
- N.B. W need not contain a token of S.

Scrutability

- Scrutability of truth and reference: For any expression token, sufficient information about the state of the world enables the speaker to know the expression's extension

- E.g. complete information about objects and substances in the environment (e.g. about their composition, distribution, behavior, appearance, and relation to oneself) enables a subject to know (on rational reflection, without further empirical information) that
  - water is H2O
  - Hesperus is Phosphorus
  - Twain is Clemens
  - renates are cordates

Nontriviality

- The sufficiency is usually nontrivial
  - a description free of "water" and cognates suffices for "water=H2O"
  - a description free of "Twain" and cognates suffices for "Twain is Clemens"

- More specifically: For most sentences S, there is a description D of the world such that D epistemically necessitates S, nontrivially.
  - Arguably (though this is not required): physical, phenomenal, indexical and that's-all information (PQTI) suffices for all truths
  - See "Conceptual Analysis and Reductive Explanation"

- So most expressions have a nontrivial epistemic intension.

Tokens and Types

- A given linguistic expression may be a priori for one speaker but not for another
  - E.g. ‘Neptune perturbs the orbit of Uranus’: a priori for Leverrier, but not later users.
- So different tokens of an expression type can have different epistemic intensions (cf. Frege on the sense of `Aristotle’)
- Use token-relative apriority o define token-relative epistemic intensions.
- E.g.: an expression token is a priori when it expresses a thought that can be justified independently of experience.
  - Where thoughts are the token mental states (beliefs or belief-like propositional attitudes such as entertainings) expressed by assertive sentences.

Epistemic Intension as Meaning

- For some linguistic expressions, epistemic intensions vary between occasions of use: e.g.
  - names ('Neptune', 'Godel')
  - natural kind terms ('water', 'iron')
  - demonstratives ('that', 'there')
- For such expressions, epistemic intension is not part of "linguistic meaning", but rather "utterance meaning".
- For other linguistic expressions, epistemic intensions are constant between occasions of use: e.g.
  - pure indexicals ('I,', 'here')
  - some quasi-descriptive terms ('circle')
  - descriptive names? ('Julius', 'Jack the Ripper')
- For such expressions, epistemic intension is part of linguistic meaning

Core Thesis

- Epistemic intensions plausibly satisfy the Core Thesis
- If S is a priori
  - Any W will verify S, so S has a necessary epistemic intension
- If S is not a priori
  - ~S will be epistemically possible
  - So there will plausibly be an epistemically complete D that epistemically necessitates ~S
  - On option 2: some maximal epistemic possibility automatically verifies ~S
  - On option 1: a centered world verifies ~S, if there is a world for every maximal epistemic possibility
- On option 2, core thesis is straightforwardly satisfied
- On option 1, core thesis is plausibly (but controversially) satisfied

Contextual Problem Cases

- Contextual intension problem cases are no problem here
- ‘Language exists’
  - A posteriori, and false at language-free scenarios
- ‘Water is H2O’
  - A posteriori, and false at Twin Earth scenarios
- Worlds where ‘water’ means steel
  - Irrelevant to evaluation (it is a posteriori that the orthographic string ‘water’ refers to water)
- “What is held constant” across scenarios
  - No need for tokens in scenarios, so no need to hold anything constant

Semantic Contextual Intensions

- Can use epistemic intensions as a semantic value to define a sort of semantic contextual intension
- The resulting semantic contextual intension will be a restriction of the epistemic intension
  - restricted to worlds containing a token at the center with the same epistemic intension
- Will not satisfy core thesis (because of e.g. `language exists'), but reasonably close
- These semantic contextual intensions are a quasi-Fregean semantic value
  - but essentially derivative on epistemic intensions

Linguistic Contextual Intensions

- In some cases, epistemic intension is part of and exhausts linguistic meaning
  - E.g. pure indexicals, some descriptive terms
- In these cases, the linguistic contextual intension is a restriction of the epistemic intension (to worlds containing the expression at the center)
- So in these cases, linguistic contextual intension will be a quasi-Fregean semantic value

Kaplan's Character

- Kaplan's character is roughly linguistic contextual intension
  - so is quasi-Fregean precisely when linguistic meaning is epistemic intension
  - This explains usefulness in indexical cases, and limitation to these cases
- N.B. Kaplan's discussion often suggests a contextual intension
  - E.g. Fregean individuation of demonstrations, names have reference essentially – only relevant if character is like contextual intension
- But "occurrence" discussion suggests something else
  - Kaplan notes: If token is required in contexts, epistemic limitations arise (validity, conjunction, etc), so invokes occurrence = context plus expression
  - Does not define evaluation, but may be tacitly invoking epistemic intensions
  - Q: If so, why not nontrivial character for names?
- Overall: character is epistemically useful largely insofar as it approximates epistemic intension

Stalnaker's Diagonal

- Stalnaker's diagonal proposition is officially much like an orthographic contextual intension (but token-reflexive).
- For many explanatory purposes, Stalnaker invokes a restriction of the diagonal proposition to tokens sharing semantic or presemantic features
  - In effect, is invoking a hybrid orthographic/semantic or orthographic/presemantic contextual intension
  - Arguably: epistemically relevant insofar as they approximate epistemic intensions
- N.B. epistemic intension is not defined as a diagonal (see later)

Evans' Deep Necessity

- Evans distinguishes superficial necessity from deep necessity for descriptive names
  - Superficial necessity is tied to modal contexts
  - Deep necessity is tied to cognitive content
  - "Julius invented the zip" is superficially contingent but deeply necessary
- Modal defn: S is deeply necessary when any possible token of S is true
  - Suggests: linguistic contextual intensions
  - Evans : linguistic meaning of a descriptive name is its descriptive content;
  - LCI construal plus this thesis explains restriction to descriptive names
- N.B. LCI construal conflicts with cognitive construal
  - E.g. Let L be a descriptive name for the number of actual languages
  - Then L>0 is epistemically contingent but has necessary LCI
  - Perhaps: Evans really needed epistemic intension, and LCI construal was an inessential misstep?

D&H's Fixedly Actually

- Davies and Humberstone: Evaluate sentences as "floating" actual world (world considered as actual).
- How does this evaluation work?
  - Not contextual.
  - In some cases (descriptive names), same results as epistemic.
  - In other cases (ordinary names), rigid evaluation.
- Evaluation appears to depend on prior assumptions/axioms about the semantics of language.

The Second Dimension

- Basic notion of second dimension: S is subjunctively necessary ("metaphysically necessary") iff it might have been that S
- Possible worlds = maximal subjunctive possibilities
- Subjunctive intensions = functions from worlds to truth-values
  - Subjunctive intension of S is true at W iff W satisfies S.
- Informally: W satisfies S iff: if D had been the case, S would have been the case (subjunctive conditional with canonical description)
- Formally: W satisfies S iff D subjunctively necessitates S
  - I.e. if D&~S is subjunctively impossible
- S is (subjunctively) necessary iff S has a necessary subjunctive intension

2-D Intensions

- Can associate expressions with two-dimensional intensions:
  - (scenario, world) -> extension
- For sentences: S is true at (V, W) iff V epistemically necessitates that W subjunctively necessitates W
  - Test: if V is actual, then if W had been the case, would S have been the case?
- From 2-D intension, can define a diagonal intension over centered worlds
  - Diagonal intension maps a centered world W to the 2-D intension evaluated at (W', W''), where these are the corresponding scenario and world
- The diagonal intension is equivalent to the epistemic intension (restricted to centered worlds, if necessary).
  - But epistemic intension is not defined as a diagonal
  - It is defined in purely epistemic terms, free of any subjunctive element

Application: Fregean Sense

- The epistemic intension of an expression is much like a Fregean sense

- A, B have same sense iff "A=B" is cognitively insignificant
- A, B have same epistemic intension iff "A=B" is a priori

- Sense determine reference
- Epistemic intension determines extension (in a scenario)

- Main differences:
  - Rational idealization on cognitive significance (but can relax this)
  - Indexicality of senses

- See: "On Sense and Intension"

Application: Narrow Content

- Can define epistemic intensions for (token) concepts and beliefs, much as for linguistic expressions
  - Epistemic necessity operator on beliefs (apriority)
  - Beliefs can be verified or not by scenarios
- The epistemic intension of a belief is plausibly determined by the internal state of the believer
  - E.g. Oscar, Twin Oscar have same "water" epistemic intensions
  - Bert, Twin Bert have same "arthritis" epistemic intensions
  - Apriority of beliefs plausibly supervenes on internal state
- So epistemic intension is a natural candidate for the narrow content of concepts and beliefs.
- See "The Nature of Epistemic Space", "The Components of Content"

Application: Indicative Conditional

- Can use epistemic intensions to define correctness conditions for indicative conditionals
  - I.e. intuitive correctness conditions ("assertibility conditions")
- "If A, then B" is correct iff the epistemically closest scenarios that verify A also verify B
  - The epistemic closest scenario that verifies A also verifies B.
  - Need to define "epistemic closeness" (will be relative to a subject's knowledge and/or beliefs)
- Analogous to Lewis-Stalnaker truth-conditions for subjunctive conditionals
- See "The Tyranny of the Subjunctive", "The Nature of Epistemic Space"

Conclusions

- The epistemic understanding of two-dimensional semantics is the most fundamental for epistemic purposes
- Contextual understandings of two-dimensional semantics are useful for epistemic purposes precisely insofar as they approximate the epistemic understanding
- The epistemic understanding is based on a sort of modal evaluation that is constitutively tied to the epistemic domain
- This restores the (broken) link between reason and possibility, and thereby restores the Fregean link between meaning and reason.