THE LEXICAL SEMANTICS OF PARENTHETICAL-*AS* AND APPOSITIVE-*WHICH*

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Abstract. Despite their superficial similarities, nonrestrictive relatives and *as*-parentheticals show contrasting behavior in a range of apparently disparate domains, including (i) equative constructions (section 4); (ii) selective island contexts (section 5); and (iii) clause-internal "niching" (section 7). Additionally, *as*-parentheticals allow a wider range of interpretations relative to their antecedents than do appositive relatives (section 6). This paper offers a unified account of these differences and others based largely on the respective semantic types of the gaps these clauses define: *as*-clause traces are propositional; nonrestrictive relative traces are individual denoting (i.e., nominalized propositions). The type distinction follows from the lexical denotations of these morphemes (section 2) and combines with independently motivated principles to predict the clauses' divergent behavior. The analysis also unifies the various kinds of appositive-relatives and similarly informs our understanding of predicate-type *as*-clauses (e.g., *Sue hates parties, as does Ali*); see section 8.

1. Remarks

In his classic 1984 paper "Inner islands," Ross proposes that certain puzzling contrasts between the appositives italicized in (1) are due to the "adverbiality" of *as*.[1]

(1)   a. Americans should get cheap oil, *as the whole world knows t.*
      b. Americans should get cheap oil, *which the whole world knows t.*

I call appositives of the (1a) sort *as*-parentheticals or *as*-clauses; (1b) involves a (clausal) nonrestrictive relative (NRR). Ross's characterization of *as* as "adverbial" allows him to link extraction failures like those in (2), since they can be attributed to the general markedness of extracting an adverb across a syntactic island boundary; compare (3) in which the extractees lack "adverbiality."[2]

[1] See also Ross 1967/1984 (sect. 6.1.1.4) and Ross 1973 (p. 151, n. 21), the latter a squib-length footnote on *as*-clauses.
[2] Ross motivates his proposals using data involving extraction across negation. As I show in section 5.2, the situation regarding such extraction is more complicated empirically than it is for selective islands like the adjunct in (2) and (3).

(2)   a.   *Aldrich stole the files, as Op_1 the investigator hesitated before
           announcing t_1.
      b.   *[How confidently]$_1$ did the investigator hesitate before
           announcing t_1 that Aldrich stole the files?
(3)   a.   ?Aldrich stole the files, which Op_1 the investigator hesitated before
           announcing t_1.
      b.   ?What$_1$ did the investigator hesitate before announcing t_1?

Although the ungrammaticality of (2a,b) receives a uniform treatment here, I do not follow Ross in attributing them to ''adverbiality.'' ''Nonindividualhood,'' though lacking in Rossian zip, is more accurate. This paper's basic claim is that *all* NRRs involve extraction of an individual-denoting phrase (type $\langle e \rangle$), even those that appear to pronominalize something propositional, as in (1b) or something predicative, as in (4a).

(4)   a.   Ali could see the jackalope, which Joan also (said that she) could t.
      b.   Ali could see the jackalope, as Joan also (said that she) could t.

In contrast, (1a) contains a proposition-type trace, whereas (4b) contains a property-type trace (type $\langle s, \langle e,t \rangle \rangle$). The status of these various variables follows from the respective morphemes' lexical denotations, which are identical up to variable type (see section 2). The minimal difference combines with independently motivated principles to predict not only extraction contrasts but a host of other semantic and syntactic points of divergence. At the same time, the similarity of the lexical entries jibes with the many distributional parallels of these constructions.

A theme of this paper, and the larger research program of which it is a part, is that wide ranging and apparently unconnected restrictions (and freedoms) on structures can be made to follow from the lexical denotations of particular morphemes. Importantly, these denotations are not specific to English. Ross's observations about the appositives in (1) extend not only to the clause types in (4) (see section 8) but also to German pairs like (5), which diverge as the English cases do.

(5)   a.   Amerikaner sollten minderwertiges Benzin kriegen, was   die
           Americans should low-quality   oil   get   which the
           ganze Welt t weiss.
           whole world knows
           'Americans should get cheap oil, which the whole world knows.'
      b.   Amerikaner sollten minderwertiges Benzin kriegen, wie die
           Americans should low-quality   oil   get   as the
           ganze Welt t weiss.
           whole world knows
           'Americans should get cheap oil, as the whole world knows.'

Danish NRRs and *as*-clauses also pattern as expected. Thus, though the denotations I offer feature English words, they define crosslinguistically common operators and, as a consequence, crosslinguistically common clause types.
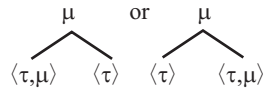
2. Lexical Entries for *As* and *Which* and Semantic Combinatorics

This section reviews the type-driven semantics framework that forms the basis for my analysis. In the interest of space, I present the technical details first and then illustrate how they work and provide initial motivation for them.

The combinatoric axioms are those in (6); the statement of Function Application (FA) in (6a) links this operation to structural sisterhood in the syntax. The version of Predicate Abstraction (β-conversion) in (6b) allows abstraction over a variable of any type.[3,4]

(6)   a.   Function Application (FA)

For all semantic types $\langle \tau,\mu \rangle$ and $\langle \tau \rangle$,

$$\underset{\langle \tau,\mu \rangle \quad \langle \tau \rangle}{\mu} \qquad \text{or} \qquad \underset{\langle \tau \rangle \quad \langle \tau,\mu \rangle}{\mu}$$

b.   Predicate Abstraction (PA)
If α is a formula of type $\langle t \rangle$ and X is a variable of type μ, then $\lambda X[\alpha]$ is a formula of type $\langle \mu,t \rangle$. (α need not contain a free occurrence of X.)

Much of the analysis to follow depends on the nominalization function in (7), which maps any proposition to its entity correlate. ("ι" is a definite operator.)

(7)   If $p \in D_{\langle s,t \rangle}$, then $^{\cap p}(p) = [\iota^p : \forall w \in p : w \leq x^p]$ and $^{\cap p}(p) \in D_{\langle e \rangle}$.

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[3] In unary-branching structures, the mother node inherits the denotation of its daughter. I assume also functional intersection (see (41)) and the type-shifting operator IDENT (see note 15), but only for analyses peripheral to the main argument. Finally, I extensionalize wherever possible and allow free shifting between extensional and intensional denotations (Montague's ^ and $^\vee$ operators). This is important only in the discussion of predicate-NRRs in section 8.

[4] Some conventions:

(i) x,y,z are variables over individuals, type $\langle e \rangle$.
(ii) p,q are variables over propositions, type $\langle s,t \rangle$.
(iii) P,Q are variables over sets of propositions, type $\langle \langle s,t \rangle, t \rangle$.
(iv) f,g are variables over properties, type $\langle s, \langle e,t \rangle \rangle$.
(v) F,G are variables over sets of properties, type $\langle \langle s, \langle e,t \rangle \rangle, t \rangle$.
(vi)   A superscript on a variable indicates its sort, so that X^Y is a variable of type X of sort Y.

To emphasize the correspondence, a syntactic trace with subscript i is translated as a free variable X_i. I indicate explicit world variables as subscripts: $\lambda w[\lambda x[\mathbf{sob}(w)(x)]] = \lambda w[\lambda x[\mathbf{sob}_w(x)]]$.

This kind of shift, from the functional domain to the entity domain, is central to the semantics of Chierchia 1984 and Chierchia and Turner 1988 (see also Partee 1987 and Chierchia 1998).[5] The notation x^p indicates an individual variable of the proposition sort; the notation $x \leq y$ means that x is a subpart of y. One can conceive of the output of (8) as the plural individual composed of all and only the worlds in the input proposition; (8) illustrates with a proposition whose value is the trio of worlds w_1, w_2, w_3; I use small capitals as a shorthand for expressing nominalized propositions.

(8)   a $\lambda w[\textbf{tough}_w(ali)] = \{w_1, w_2, w_3\}$
      b. $^{\cap p}(\lambda w[\textbf{tough}_w(ali)]) = [w_1 \oplus w_2 \oplus w_3] = [\text{ALI-IS-TOUGH}]$

I stress, however, that nothing hinges on the decision to model nominalized propositions in this way. The ontology assigned these objects does not affect the soundness of the underlying mathematics, and the present analysis depends only on the claim that natural languages make use of propositions both as sets of worlds and as individuals, not on the nature of this division. Extensive independent evidence for the use of $^{\cap p}$ on propositions, and in particular on those expressed by *matrix* clauses, is provided in section 4.1. In section 6, I motivate a restriction on the application of (7) that links it to a specific syntactic configuration, modifying the restriction that Chierchia (1984:sect. 1) proposes.

Also appropriately included with the axioms are the denotations for lexical items, because these are central in determining what we can derive (i.e., the range of possible meanings for syntactic structures that are predicted to exist). The two that form the core of my proposals are those for *as*-morphemes and NRR pronouns, stated in (9) and (10), respectively. The denotation for *as*-morphemes is motivated at length in Potts, forthcoming.

(9)   **as** = $\lambda Q \in D_{\langle\langle s,t\rangle,t\rangle}$ $[\lambda p \in D_{\langle s,t\rangle} : Q(p)$ is true $[p]]$
(10) **which** = $\lambda f \in D_{\langle e,t\rangle}$ $[\lambda x^p \in D_{\langle e\rangle} : Q(x)$ is true $[x^p]]$

These denotations are structurally identical but differ with respect to argument types: *As* takes a set of propositions as its first argument, returning a partial identity function on propositions. In contrast, the first argument to *which* is a set of nominalized propositions; the result of application is a partial identity function on *nominalized* propositions.

Given the complexity of these meanings, it is worth pausing to analyze their role in the compositional semantics. Since the focus of this paper is NRRs, I illustrate with *which*, indicating where *as* differs. (11) is the structure and semantics for a typical NRR clause.

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[5] In section 8, I adopt a variation of $^{\cap p}$, here symbolized as $^{\cap f}$, that takes properties to individual concepts (from $\langle s, \langle e,t\rangle\rangle$ to $\langle s,e\rangle$).

(11) a.   which$_1$ Ali noted t_1

  b.

The meaning of the root node is a *partial identity* function from nominalized propositions to nominalized propositions—that is, an expression in $\langle e,e \rangle$. The heart of the semantics, and the distinguishing feature of the denotation in (10) (and also (9)), is that the clause is a *partial* function. I express partial functions using the notation "$\lambda X \, \lambda Y : X(Y) \ldots$ is true", which is not the saturation of an argument slot in X but rather a means for placing an additional restriction on the range of possible arguments to X, above and beyond their types. The notation is borrowed from Heim and Kratzer (1998), who use it to express, for example, that *both* requires its restriction to denote a two-membered set; (12) is based on the denotation of Heim and Kratzer (1998:154).

(12)   **both** $= \lambda f : |\{x : f(x)\}| = 2 \, [\lambda g \, [f(x) \to g(x)]]$

In parallel with (12), application of an NRR clause to a nominalized proposition x^p succeeds just in case it is true in the actual world that (in the case of (11)) Ali noted x^p. That is, the function's output is x^p if x^p satisfies this condition, else the computation cannot proceed. Thus, the content of the NRR (or the *as*-clauses) is contributed solely as a condition on felicitous contexts—it exists only as a conventional implicature or presupposition. This means that when an NRR N is adjoined to a clause C, the semantic value of C is exactly what it would have been if N had not been adjoined; see (13).

(13) a.   Ed vanished, which Ali noted.

b.

$$CP:$$
$$[\text{ED-VANISHED}]$$

$$CP_A:$$
$$[\text{ED-VANISHED}]$$

$$CP_B:$$
$$\lambda x^p : [\textbf{note}(x^p)(ali) \text{ is true } [x^p]]$$

$$C:^{\cap p}$$

$$IP:$$
$$\lambda w[\textbf{vanish}_{\text{w}}(ed)]$$

which Ali noted

Ed vanished

The matrix clause *Ed vanished* shifts to denote a nominalized proposition, to provide a suitable argument for the NRR. The result of FA between CP_A and CP_B is simply this nominalized proposition again. Crucially, though, the root CP denotes if and only if it is true in the actual world that Ali noted that Ed vanished. In this way, we obtain the "widest scope" effect associated with NRRs (Chierchia & McConnell-Ginet 1990:sect. 6.2.1; McCawley 1998:448).[6] Placing an NRR in the scope of, for example, a negation, does not affect the truth of the NRR, because it is in fact not even part of the function that the negation applies to:

(14) It is not the case that Ed vanished, which Ali claimed.

One possible reading of the NRR in (14) is *Ali claimed that Ed vanished*. This places the NRR in the syntactic scope of the matrix-clause negation. Yet the sentence has no reading in which the NRR is negated; it is infelicitous in a situation in which Ali did not claim anything about Ed's vanishing. This follows directly from the semantics above; the result of applying *Ed vanished* to *which Ali claimed* is just the proposition that Ed vanished, which is in turn negated. But calculation proceeds to this point just in case Ali claimed that Ed vanished.

Embedding these clauses under *believe*-type predicates yields additional evidence in favor of "filtering off" their content. For example, neither (15a) nor (15b) entails that James believes anything at all about Sid's assertion that Ali is tough.

(15) a.   James believes that, as Sid asserted, Ali is tough.
     b.   That Ali is tough, which Sid asserted, surprises James a great deal.

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[6] This is true also of *as*-clauses and is also a consequence of their being (partial) identity functions.

c.

IP:
surprise(*james*)([ALI-IS-TOUGH])

CP: I ´:
[ALI-IS-TOUGH] λx[**surprise**(*james*)(*x*)]

⟨ *suprises James a great deal* ⟩

CP: CP:
[ALI-IS-TOUGH] λx^p : [**assert**(x^p)(*sid*) is true [x^p]]

⟨ *which Sid asserted* ⟩

C:$^{\cap p}$ IP:
λw[**tough**$_w$(*ali*)]

⟨ *That Ali is tough* ⟩

As the annotated structure in (15c) indicates, the lack of this entailment is a consequence of (10). The argument of the function corresponding to *surprises James* does not contain the content of the NRR.

One could seek to obtain this effect by following McCawley (1998:sect. 13b) in adjoining NRRs to the matrix clause obligatorily. However, this would greatly complicate representations, demanding that one sever all ties between linear precedence and dominance (contra the usual axioms for trees; see Partee, ter Meulen & Wall 1993:sect. 16.3 and Rogers 1998:sect. 3.2). What's more, it would require new semantic composition principles, because the phrase that supplies the meaning of the NRR gap would often not be its structural sister. These theoretical points are in themselves persuasive. There is empirical evidence against McCawley's proposal as well. Potts (forthcoming) offers evidence that *as*-clauses adjoin in the manner of regular adverbial phrases.[7] Similar arguments justify roughly the same analysis of NRRs. Space precludes a full discussion, but the following case is suggestive:

(16) a.   That Ali is tough, which James reported in the papers, surprised everyone.
      i.   NRR = James reported that Ali is tough in the papers.
      ii. NRR ≠ James reported that it surprised everyone that Ali is tough.

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[7] A piece of evidence for this treatment of *as*-clause adjunction that is not provided in Potts, forthcoming, is that if such a clause intervenes between verb and object, the object must scramble, something the indefinite in (i) and (ii) cannot do.

(i)   Es ist klar, dass Helmut, wie du   ja gesagt hast, Kartoffeln essen möchte.
       it is clear that Helmut as   you PRT said   have potatoes   eat   would-like
       'It is clear that Helmut likes, as you said, to eat potatoes.'
(ii) *Es ist klar, dass Helmut Kartoffeln, wie du ja   gesagt hast, essen möchte.
       it is clear that Helmut potatoes   as you PRT said   have eat   would-like
       'It is clear that Helmut likes to eat, as you said, potatoes.'

b. That Ali is tough surprised everyone, which James reported in the
papers.
i. NRR $\neq$ James reported that Ali is tough in the papers.
ii. NRR $=$ James reported that it surprised everyone that Ali is
tough.

These examples are unambiguous. (16a) does not have a reading in which
James reported that it surprised everyone that Ali is tough. In contrast, (16b)
has only this reading. But on a treatment in which NRRs adjoin at the root
node, these examples have exactly the same constituent structures, differing
only in the placement of the NRR in the string. There seems to be no natural
way to obtain interpretive contrasts like these if NRRs are syntactically
invariant in their adjunction point. But they follow directly from an account
based on (10), which demands direct adjunction of the NRR to its argument.

With this understanding of the proposed meanings for NRR- and *as*-
morphemes as background, I turn, in sections 3–7, to arguments for the point
of divergence between (9) and (10): gap/variable type.

3. The Syntactic Status of the Gaps

It is useful to begin probing these clauses by gaining an understanding of
their internal syntax. This section investigates the nature of the traces in
examples like (17).
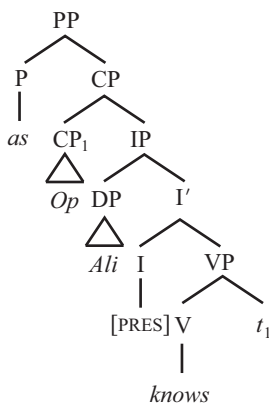
(17)   a.   ...as Ali knows   b.   ...which Ali knows
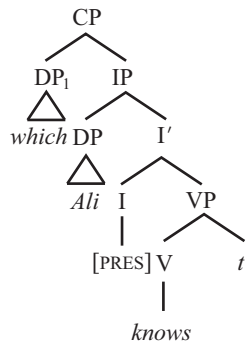
As indicated, the gross syntactic structure of these clauses is slightly
different, but mostly in ways that do not significantly affect semantic
composition. Stowell (1987:sect. 1.1) and Potts (forthcoming) argue that *as*-
clauses are PPs. The complement CP to the head P^0, *as*, contains an extracted
null operator in its specifier. Movement is forced by the lexical properties of

as, which requires a set of propositions as its argument; in defining the syntactic selectional properties of *as*, one must say only that *as* selects for a (tensed) CP complement.

In contrast, *which* is an actual extractee. Evidence that it is the mover in NRRs comes from pied-piping (*Ali is tough, of which we were easily persuaded*; see Stowell 1987:sect. 2.1). Again, movement is forced to avoid a type mismatch: *which* requires a set of propositions as its argument (type $\langle\langle s, t\rangle, t\rangle$) but it is underlyingly the sister of *know*, an intensional two-place relation between propositions and individuals (type $\langle s, \langle\langle s, t\rangle, \langle e, t\rangle\rangle\rangle$).

The work of Stowell (1987:sect. 2.2) and Postal (1994) provides a sound basis for the conclusion that *as*-clause gaps are non-DP gaps, whereas NRR gaps are in fact nominal. Clear evidence comes from cases in which extraction determines a preposition, one that is illicit when the complement is clausal. The sentences in (18) and (19) are based on examples from Stowell (1987:sect. 2). (See also Postal 1994:72ff.)

(18) a   We are aware (*of) that the earth is round.
     b.   The earth is round, as we are well aware (*of).
     c.   *The earth is round, of as we are well aware.
(19) a.   We are aware *(of) the fact that the earth is round.
     b.   The earth is round, which we are well aware *(of).
     c.   The earth is round, of which we are well aware.

With regard to these ''epenthetic'' prepositions, *as*-clause gaps pattern with CPs, and NRR gaps with DPs. Following Stowell (1987), I claim the parallel in (18) indicates that the gap in *as*-clauses is, syntactically, a CP.

The same argument can be made based on German verbs that either optionally or obligatorily take prepositional complements. Verbs such as *sich beklagen über* ('to complain about'), which obligatorily select their PPs, do not have well-formed *as*-clauses nor do they take nonextraposed *dass*-complements. But they form NRRs in which the preposition is incorporated into the relative pronoun, realized in such cases as *wo*-; (20) illustrates.[8]

(20) a.   Er beklagte   sich immer *(darüber),   dass er kein Geld
           he complained self always   there-about that he no   money
           hatte.
           had
     b.   *Er beklagte   sich über, dass er kein Geld   hatte.
           he complained self about that he no   money had

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[8] The verb *klagen* ('to complain'), which can be used without a preposition, yields nice minimal pairs, as it has well-formed *wie*-clauses but no NRRs:

    (i)   Er hat kein Geld, {wie/*was} er immer klagt.
        he has no   money as/which   he always complains
        'He has no money, as/which he always complains.'

   c. *Er hatte kein Geld, wie er sich immer beklagte   (über).
       he had   no   money as he self always complained about
   d. Er hatte kein Geld, worüber   er sich immer beklagte.
       he had   no   money where-about he self always complained

Verbs such as *sich erinnern* (*an*) ('to remember'), which optionally select
PPs, have well-formed *as*-clauses only when the P^0 is not realized. The
corresponding NRRs must contain an incorporated preposition:

(21) a.   1989 fiel die Mauer, {woran/*was}   ich mich erinnern   kann.
           1989 fell the wall   where-on/which I   self remember can
      b.   1989 fiel die Mauer, wie ich mich (*daran)   erinnern   kann.
           1989 fell the wall   as I   self   there-on remember can
      c.   Ich erinnere   mich *(an) den Fall der   Mauer.
           I   remember self   on the fall of-the wall

Again, the German verbs show one behavior with DP and NRR gaps and
another with CP and *as*-clause gaps.
    Postal (1994:72) observes that *as*-clause extraction is possible with verbs
like *boast* and *comment*, which do not allow DP objects and, in fact, require
CP complements. Here again the opposite obtains for NRRs:

(22) a.   Albert {boasted/commented/complained} that the results were
           fantastic.
      b.   The results were fantastic, as Albert {boasted/commented/
           complained}.
(23) a. *Albert {boasted/commented/complained} {that/it/a belief that the
           results were fantastic}.
      b. *The results were fantastic, which Albert {boasted/commented/
           complained}.

Stowell (1987:sect. 2.2) supports this contrast using raising verbs, which
take clausal, but not DP, complements, as in (24). His observations extend to
German, as in (25).

(24) a.   It appears (*a fact) that the earth really is round.
      b.   The earth is round, {as/*which} it appears.
(25) Helmut, {wie/*was} es uns schien, hat zu viel Curry Wurst
      Helmut   as/which it us   seems has too much Curry Wurst
      gegessen.
      eaten
      'Helmut, {as/*which} it seems to us, has eaten too much curry-soaked
      sausage.

A subtler argument based on selectional specifics starts from the observation that *as*-clause gaps are insensitive to *antipronominal contexts*— positions blocking weak definite pronouns. This is seen in (26), in which the verb *tell* is used in its 'determine' sense. Postal (1998:4) cites (26a) as evidence that this site is antipronominal and observes that such sites correlate strongly with failed NRR formation (among other extractions), suggesting that this extraction type—a *B-extraction* in his terminology—demands a silent weak pronoun in its gap site.[9] In contrast, *as*-clauses like (26c) are unproblematic.

(26)   a.   We could tell {*it/that/that Ames was a spy} just by looking in his martini glass.
       b.   *Ames was a spy, which$_1$ we could tell t_1 just by looking in his martini glass.
       c.   Ames was a spy, as$_1$ we could tell t_1 just by looking in his martini glass.

I can add to the above set of arguments for a syntactic contrast in gap type that *as*-clause gaps cannot host resumptive pronouns.[10] Although island-saving resumption is not robust in English, even for DP extraction (but see Prince 1990), *as*-clauses seem not to allow this strategy at all; see

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[9] The validity of this implication is perhaps in doubt. One finds examples such as (i).

   (i)   "How far away this goes on I can't tell."
         —Richard Ford. 1989. Accommodations. In *The Best American Essays 1989*, ed. G. Wolff, 114. New York: Ticknor & Fields.

However, Postal's (1998) generalization is an implication. In its strongest form, it says that if a speaker judges site *X* antipronominal, then he disallows, for example, topicalization from *X*. So (i) is a counterexample only if Ford rejects the *it* in (23a). This cannot be taken for granted; some speakers do not deem this site antipronominal; see the book title in (ii) and also Levine 2001 (ex. (48a,b)).

   (ii)   Boutell, H. S. 1949. *First editions of today and how to tell them: American, British, and Irish.* 3d ed., rev. and enl. by Roger Boutell. University of California Press, Berkeley, California.

[10] The argument from resumptive pronouns is not available for German. Merchant (2001:sect. 4.3.2.2) concludes from an extensive factual survey that German "seems not to possess the kind of resumptive strategy familiar from English" (p. 162). Webelhuth (1992:sect. 3.3.6) offers the same descriptive generalization, citing (i) as an instance of failed resumption. Examples (ii) and (iii) show that the same facts obtain in island contexts.

   (i)   [Dass Maria wegfährt] bereue ich (*es).
          That Maria leaves   regret I   it
          'That Maria is leaving, I regret.'
   (ii)   Maria ist weggefähren, was   ich (*es) bereue.
          Maria is left   which I   (it) regret
          'Maria left, which I regret.'
   (iii) ??Maria ist weggefähren, was   ich fragte Juan, wann er (*es) lernte.
          Maria is left   which I asked Juan when he (it) learned
          'Maria left, which I asked Juan if he knew.'

(27). (Thanks to James Darrow for assistance in constructing plausible tests.)

(27)   a.   [Proposition 209]$_1$ was the measure that they elected a candidate who had made it clear that she was against it$_1$. (Merchant 2001: (69b))
       b.   *Durians are delicious, as Chris asked Nina whether she read the magazine article that said {it/that}.

Once again, *which*-relatives contrast with *as*-clauses in this regard, suggesting a DP gap:

(28)   Durians are delicious, which$_1$ Chris asked Nina whether she read the magazine article that said {it$_1$/that$_1$}.

The proposal that these clauses' gaps differ in syntactic type is well supported.[11] This is strong indirect evidence for a semantic contrast of the sort proposed in (9) and (10). The Montagovian premise that syntactic category determines semantic type is denied in some frameworks (Bittner 1999, among others), but even these systems maintain a close link at the level of basic types, the divergences showing up only in the results of complex type-shifting. So it seems clear that the above syntactic contrasts should not be obscured in the semantics. What's more, there is extensive, purely semantic evidence for the contrast. I turn to that now.

4. The Status of the Semantic Variables

This section motivates both the presence of $^\cap p$ in the semantics and the type distinctions in the denotations of section 2. The main argument is from the contrast in (29) and (30), which involves what I call the *CP-equative* construction.[12]

(29)   a.   Joan hates parties, which (they told us) was the problem.
       b.   Joan hasst Partys, was das Problem war.   (German)
       c.   Joan hader fester, hvilket er problemet.   (Danish)
(30)   a.   *Joan hates parties, as (they told us) was the problem.
       b.   *Joan hasst Partys, wie das Problem war.   (German)
       c.   *Joan hader fester, som er problemet.   (Danish)

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[11] However, these tests fail to show a contrast in Danish. Both *som* ('as') and *hvilket* ('which') occur with the same range of verbs and do not show the expected variable behavior with respect to their syntactic gaps. This might be related to the fact that *som* also functions as a DP-modifying relative pronoun.

[12] Equatives are also commonly called *specificational* sentences, so these could also be called *specificational-CP* constructions. But the label "CP-equative" emphasizes the challenge the construction poses.

Accounting for the possibility of (29), as against (30), requires a close look at this brand of equative in general, so I turn to that first. Section 4.1 yields strong support for $^{\cap}p$ as a function from propositions to entities, operating on matrix and embedded CPs.

4.1 Interpreting CP Equatives

Paradigm (31) introduces the CP-equative construction more fully.

(31) a.   The {problem/fact/suggestion} is that Joan hates parties.
     b.   That Joan hates parties is the {problem/fact/suggestion}.
     c.   {A/One} leading idea is that space has fifty dimensions.
     d.   Given all the hoopla over string theory, it must be the case that
          SOME proposal made at the conference is that space has fifty
          dimensions.
     e.   That space has fifty dimensions was Chuck's biggest discovery.

These sentences display nearly all the defining traits of equative constructions, according to the diagnostics provided by Heycock and Kroch (1999:sect. 3.2.2; hereafter H&K).[13]

First, DP equatives lack small-clause counterparts:

(32) a.   *I consider your attitude toward Jones my attitude toward Davies.
     b.   *I consider my attitude toward Davies your attitude toward Jones.
          (H&K:(29))

These failures are unsurprising. Small clauses are predicative constructions (Partee 1987:sect. 2.2). Because equatives assert identity, neither constituent is predicated of the other. Thus, the assumption that CP-equatives assert an equality relation predicts the stars in (33). (I cite (33c) to deflect objections from "internality" effects associated with finite CPs [Ross 1967; Postal 1998:sect. 4.2.1.3.2].)

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[13] There are just two differences between these and regular (DP) equatives. First, CP equatives allow extraction of their preverbal argument; (i) is H&K's (41a).

   (i)   *[Which of the themes]$_1$ do you think t_1 is that phrase of music?

Second, H&K (p. 378, n. 9) observe that DP-equatives allow across-the-board extraction. (iiia) is theirs; (iiib) extends the observation to other symmetric predicates (Paul Postal, p.c.).

   (ii)   ?[Which idea]$_1$ did you say the only argument for t_1 is that Joan approves of t_1?
   (iii) a. [Which city]$_1$ is your opinion of t_1 my opinion of t_1?
          b. [Which proposal]$_1$ does Ed's disparagement of t_1 just reflect his ignorance of t_1?

Unlike (iii), (ii) seems to have life, if at all, only as a parasitic-gap case.

(33) a. *I consider the problem that she is bonkers.
    b. *I consider that she is bonkers the problem.
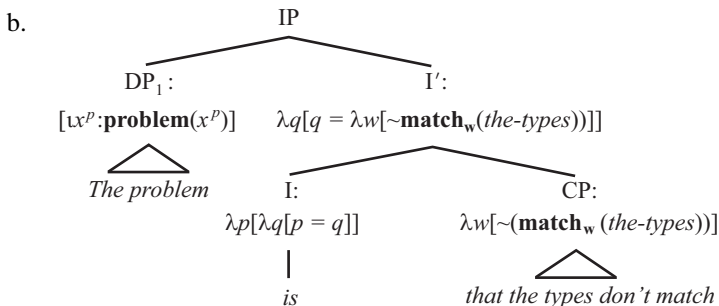   c. *I consider it the problem that she is bonkers.

Second, unlike nonequative copular sentences, both arguments admit of NRR modification. Example (34) involves a small clause to block an equative reading.

(34) I consider Rita the duty nurse (*, who is very efficient). (H&K:(32a))
(35) The duty nurse, who is very efficient, is Rita, who I am very fond of. (H&K:(31a))
(36) The problem, which Ed has already pointed out, is that Joan is bonkers, which we didn't know when we hired her.

NRRs modify only individual-denoting nominals (Karttunen 1969:sect. 1.1; see section 8 for a generalization of this statement). Thus, they cannot adjoin to the predicative *the duty nurse* in (34), which, despite its definite morphology, denotes a property, here predicated of the individual denoted by *Rita*. The pair of grammatical NRRs in (36) means that it involves two individual-denoting expressions.

In sum, the label "CP-equative" for (31) seems justified. But H&K (sect. 4) argue persuasively that equatives demand type-identity of their arguments (cf. Partee 1986; Partee 2000 endorses the H&K analysis for English). CP-equatives seem not to meet this requirement and so should be uninterpretable; see (37).[14,15]
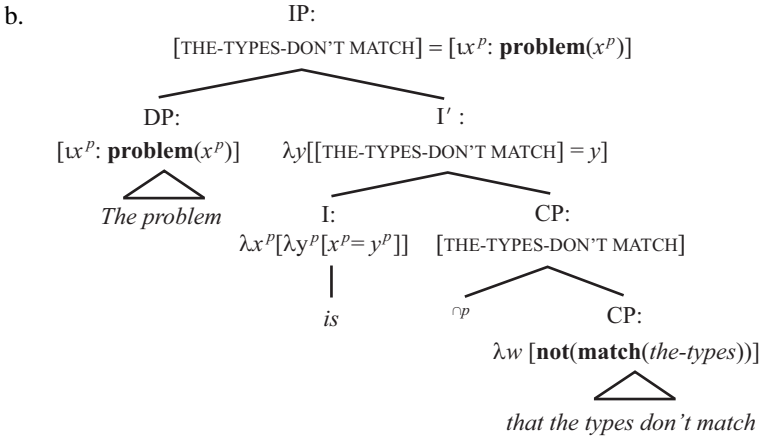
(37) a. The problem is that the types don't match.

    b.

IP

DP$_1$:   I′:

$[\iota x^p:\mathbf{problem}(x^p)]$ $\lambda q[q = \lambda w[\sim\mathbf{match_w}(\textit{the-types}))]]$

The problem   I: CP:

$\lambda p[\lambda q[p = q]]$ $\lambda w[\sim(\mathbf{match_w}\,(\textit{the-types}))]$

is   *that the types don't match*

---

[14] I assume that equative *be* takes any pair of like arguments—that is, $\mathbf{be} = \lambda X \in D_\tau\, [\lambda Y \in D_\tau\, [X = Y]]$.

Tree (37) does not depict *be* with a small-clause complement. I follow H&K in assuming that *be* in fact selects for a small clause, but this is not directly relevant. The type mismatch would simply occur lower in the structure (inside the small clause).

[15] The challenge CP-equatives pose is not specific to the equative analysis. Partee (1986, 1987), for instance, assumes that *be* takes arguments of type $\langle\tau\rangle$ and type $\langle\tau,t\rangle$, where τ is any type; application is predication. Should two individuals meet, one shifts by IDENT, defined as

However, the set of principles outlined in section 2 allows a successful derivation. If the meaning of *the types don't match* shifts by $^{\cap}p$ then the two arguments of *be* are type-identical; see (38).

(38) a.   The problem is that the types don't match.

   b.

$$\text{IP:}$$
$$[\text{THE-TYPES-DON'T MATCH}] = [\iota x^P : \mathbf{problem}(x^P)]$$

DP:
$[\iota x^P : \mathbf{problem}(x^P)]$

The problem

I′ :
$\lambda y[[\text{THE-TYPES-DON'T MATCH}] = y]$

I:
$\lambda x^P[\lambda y^P[x^P = y^P]]$

is

CP:
$[\text{THE-TYPES-DON'T MATCH}]$

$^{\cap}p$

CP:
$\lambda w\,[\mathbf{not}(\mathbf{match}(\textit{the-types}))]$

that the types don't match

The semantics of (38) equates the nominalized proposition corresponding to *that the types don't match* with the unique salient problem, as desired.

   Support for this interpretation comes from the distribution of quantified expressions. For instance, suppose we allow the proposition in (39a) to shift to the generalized quantifier type (39b).

(39) a. $^{\cap}p(\lambda w[\mathbf{hate}_w(\textit{parties})(\textit{joan})] = [\text{JOAN-HATES-PARTIES}] \Rightarrow_{LIFT}$
      b. $\lambda f[f([\text{JOAN-HATES-PARTIES}])]$

This yields a semantically well-formed structures for (40a,b), but they violate conditions on the use of these quantified DPs, which presuppose nonnull, nonsingleton domains (#*Every author of* Lolita *collected butterflies*; see Partee 1987:127).

(40) a. *{Every/Each} problem was that Joan hates parties.
      b. *{Both/Many} problems were that Joan hates parties.
      c. {Every/Each} recent proposal {claims/says} that space has fifty
          dimensions.

The nominalization operation also affords a method for interpreting nominals like *the proposal that we destroy Alaska's priceless wilderness*,

---

be $= \lambda X \in D_\tau \,[\lambda Y \in D_\tau \,[X = Y]]$. For (37), this yields arguments of type $\langle e,t \rangle$ and $\langle s,t \rangle$ if *the-problem* shifts by IDENT. If $\sim[\lambda w[\mathbf{match}_w(\textit{the-types})]]$ shifts, then the arguments are of type $\langle\langle s,t\rangle,t\rangle$ and $\langle e,t\rangle$. So the type mismatch remains.

which can receive the same treatment as in (38), sans *be* but with the addition of a shift of the nominalized proposition by IDENT (see note 15) so that it denotes a (singleton) set and can intersect with **proposal**:

(41)   George favors the proposal that we destroy Alaska.
   a.   *proposal* ⤳ $\lambda x^p[\textbf{proposal}(x^p)]$
   b.   *that we destroy Alaska* ⤳
      $\textbf{IDENT}(^{\cap p}(\lambda w[\textbf{destroy}_w(alaska)(we)])) = \lambda y^p[y^p = [\text{WE-DESTROY-ALASKA}]]$
   c.   *proposal that we destroy Alaska* ⤳
      $\lambda z^p[\textbf{proposal}(z^p) \wedge z^p = [\text{WE-DESTROY-ALASKA}]]$

   We also need $^{\cap p}$ for clausal appositive expressions such as (42).

(42)   a.   Eddie lost his house in a game of jacks—a pretty silly move.
   b.   Walt is getting married—a surprising development.

   Here we have, in effect, predicative constructions; (42b) says that the initial proposition is in the set of surprising developments. These examples are significant because they indicate that $^{\cap p}$ can apply even to matrix clauses, which we require for derivations such as (13), repeated here:

(43)   a.   Ed vanished, which Ali noted.
   b.
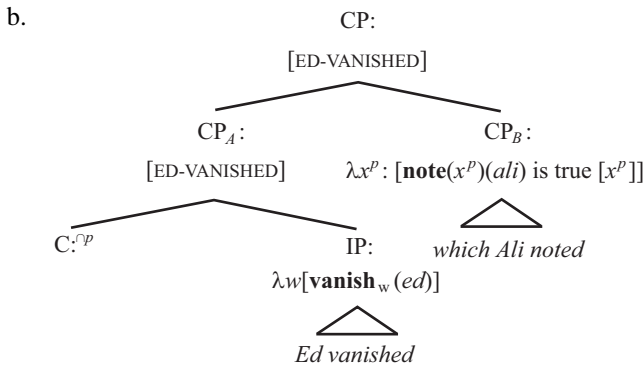
   At this point, one might object that we have not in fact obtained such evidence. These facts show that we must, in some cases, allow clauses and NPs to enter into equative or predicative relations with each other. But couldn't this be done equally well by allowing certain NPs to denote sets of propositions? I think the answer is no, but the hypothesis is worth exploring.[16]

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[16] My thanks to an anonymous *Syntax* reviewer for challenging comments.

Suppose that NPs of the class represented by *problem*, *idea*, *proposal*, and *claim* (but not, e.g., *book*, *computer*) denote sets of propositions rather than sets of entities of the propositional sort. This has undesirable implications. At the theoretical level, it entails widespread polymorphism, as suggested by (44) and (45).

(44) a. an interesting idea $\leadsto$ **interesting** $= \lambda p[\textbf{interesting}(p)]$ (type $\langle\langle s,t\rangle, t\rangle$)

  b. an interesting painting $\leadsto$ **interesting** $\lambda x[\textbf{interesting}(x)]$ (type $\langle e,t\rangle$)

(45) a. *the idea* $\leadsto$ **the** $= \lambda P[\iota p : P(p)]$ (type $\langle\langle\langle s,t\rangle, t\rangle, \langle s,t\rangle\rangle$)

  b. *the painting* $\leadsto$ **the** $= \lambda f[\iota p : f(p)]$ (type $\langle\langle e,t\rangle, e\rangle$)

This polymorphism would spread throughout the lexicon; adverbs, for example, would have to take both kinds of adjectives as their arguments; determiner modifiers like *almost* would be similarly ambiguous. There seems not to be motivation for this complication, which we avoid entirely if nouns of the *idea* class denote sets of entities and CPs denote in two domains.

Moreover, as Chierchia (1984:sect. 1) forcefully argues, allowing CPs to denote in $\langle e\rangle$ actually *reduces* the extent of type-ambiguity in the lexicon, since it means that the many verbs that take both clausal and nominal subjects can have the same type in either case. Furthermore, the arguments for determining gap type (see section 3) indicate that topicalized CPs leave nominal gaps, so that one has examples like the (46a) and (46b), which parallel (18b) and (22b).

(46) a. [That Sonia attend the interview]$_1$, I couldn't insist *(on) t_1. (Postal 1994:(23d))

  b. *[That the results were fantastic]$_1$, Albert boasted t_1.

Greek examples like (47), in which noncomplement CPs take a definite determiner (here *to* ('the')), suggest the stronger hypothesis that some CPs are themselves nominal, both when they are in situ, as in (47a), and displaced, as in (47b,c). (My thanks to Anastasia Giannakidou [p.c.] for these examples.)

(47) a. Nomizo oti [*(to) oti to ekane] ine apistefto.
       I.think that the that it he.did is unbelievable
       'I think that it's unbelievable that he did it.'

  b. Nomizo oti ine apistefto   [to oti to ekane].
       I.think that it.is unbelievable the that it he.did
       'I think it is unbelievable that he did it.'

  c. [To oti to ekane] nomizo oti ine apistefto.
       the that it he.did I.think that it.is unbelievable
       'That he did it I think is unbelievable.'

In sum, the assumption that CPs can shift from the propositional to the entity domain is widely supported by the current proposals for NRRs and by other phenomena. Moreover, it is theoretically parsimonious. Allowing NPs to shift from sets of entities to sets of propositions leads only to complications.[17]
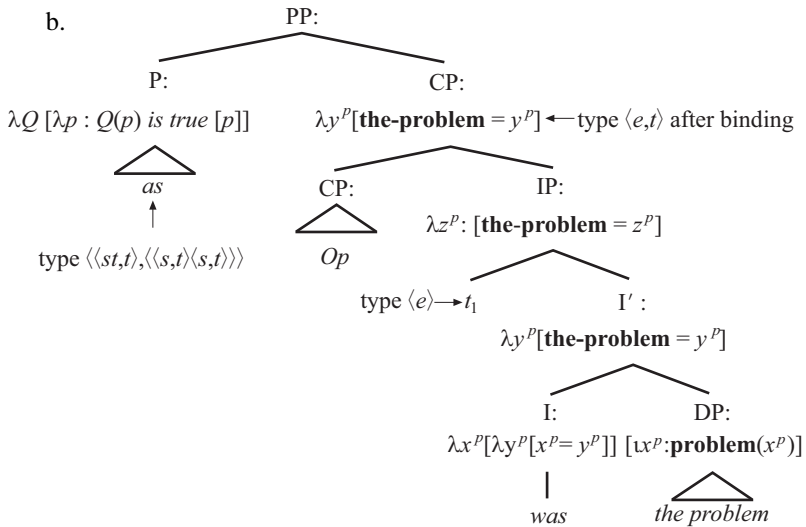
4.2 CP-Equatives' Interaction with As *and NRRs*

Another advantage to assuming that $^\cap p$ must be used to derive a nominalized proposition in CP equatives is that it yields an immediate explanation for (29) and (30). The English cases are repeated in (48).

(48) a.   Joan hates parties, which$_1$ (they told us) t_1 was the problem.
      b. *Joan hates parties, as Op_1 (they told us) t_1 was the problem.

For the lower clauses in these examples [t_1 *was the problem*] to receive an interpretation, the semantic type of t_1 must be of the entity (nominalized proposition) sort. Thus, the lexical denotation for *as* offered in (9) entails the failure of (48b). By (9), *as*-clauses are partial functions from propositions to propositions. But t_1 in (48b) must correspond to an individual variable. Thus, we have a function application freeze-up at the PP level:

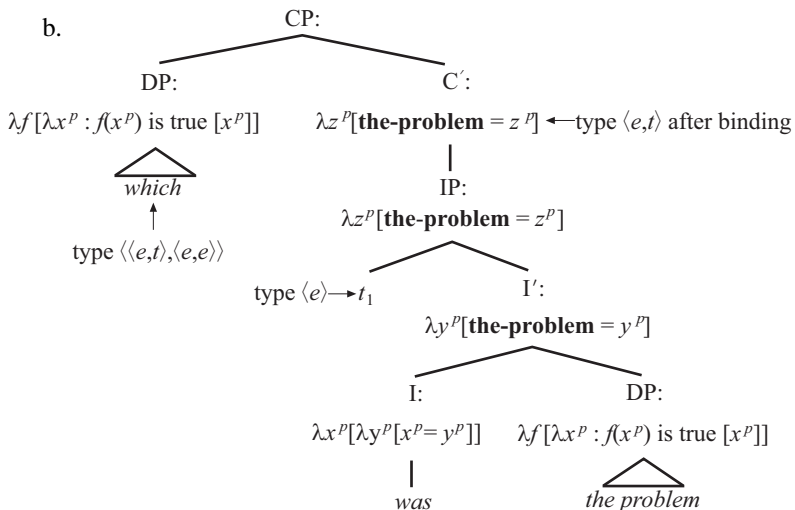(49) a. *Joan hates parties, as Op_1 t_1 was the problem.

b.

PP:

P: $\lambda Q [\lambda p : Q(p)$ *is true* $[p]]$ CP: $\lambda y^P[\textbf{the-problem} = y^P] \longleftarrow$ type $\langle e,t\rangle$ after binding

as

type $\langle\langle st,t\rangle,\langle\langle s,t\rangle\langle s,t\rangle\rangle\rangle$

CP: IP: $\lambda z^P : [\textbf{the-problem} = z^P]$

Op

type $\langle e\rangle \longrightarrow t_1$ I' : $\lambda y^P[\textbf{the-problem} = y^P]$

I: $\lambda x^P[\lambda y^P[x^P = y^P]]$ DP: $[\iota x^P : \textbf{problem}(x^P)]$

was   *the problem*

---

[17] More directly empirical objections might derive from coordination:

   (i)   We admire the idea and the book that followed.
   (ii)   They offered us a plan and the necessary funds.

Function application cannot yield a value for the PP node: **as** requires a set of propositions—type $\langle\langle s,t\rangle,t\rangle$—as its argument, but it is sister to a type $\langle e,t\rangle$ expression, which is required by the equative nature of the complement CP and the fact that *the problem* denotes in $\langle e\rangle$. The NRR case (48a) results in no such halt to the type-driven semantics, given the denotation of (10). Example (48a) is interpreted as in (50).

(50) a.   Joan hates parties, which$_1$ t_1 was the problem.

b.

CP:

DP: $\lambda f\,[\lambda x^P : f(x^P)$ is true $[x^P]]$

which

type $\langle\langle e,t\rangle,\langle e,e\rangle\rangle$

C′: $\lambda z^P[\textbf{the-problem} = z^{\,P}]$ ⟵type $\langle e,t\rangle$ after binding

IP: $\lambda z^P[\textbf{the-problem} = z^P]$

type $\langle e\rangle \rightarrow t_1$

I′: $\lambda y^P[\textbf{the-problem} = y^{\,P}]$

I: $\lambda x^P[\lambda y^P[x^P = y^P]]$

was

DP: $\lambda f\,[\lambda x^P : f(x^P)$ is true $[x^P]]$

the problem

Adjoining this clause to the CP *Joan hates parties* correctly equates its denotation, which must be the nominalized proposition [JOAN-HATES-PARTIES], with the denotation of *the idea*.

5. Extraction Contrasts

Ross (1984) opens by citing the examples in (51) and saying, "Very puzzling, on the face of it, for it is apparent that the main clause in [(51)] is in some sense the deep object of *realize*. ... Why should the negatives be fine in *which*-clauses, but excluded in *as*-clauses?" (p. 258).

(51) a.   This mist can't last, as Morpho and Hoppy (*don't) realize.
      b.   This mist can't last, which Morpho and Hoppy (don't) realize.

If *the idea* denotes a proposition, but *the book that followed* denotes an individual, then no natural type assignment to *and* will allow (i). Presumably, it would be necessary to include the inverse of $^\cap p$ among the axioms, to allow *the idea* to denote in the entity domain. This explanation is curious; the *shifted* meaning derived by this inverse would be intuitively the most natural for it, given that *the idea* patterns syntactically with other individual-denoting expressions. On the assumption that *the idea* is always an individual, this example is routine. But, again, this means that CP-equatives and NPs like *proposal that we destroy Alaska* denote sets of individuals.

Once again, Ross locates the tip of a very large iceberg. This asymmetry holds also for all selective islands (islands that allow some, usually nominal, elements to cross their boundaries). In short, NRR formation is sometimes possible from selective islands. *As*-clause extraction is strictly island bound.

In section 5.1, I show how the status of the NRR and *as*-clause gaps combines with the central proposal of Cresti (1995) to predict the different island extraction behavior. Section 5.2 turns to the difficult issue of negative contexts like (51). My intent there is to clarify the factual situation, thereby providing a sound empirical basis for a future account.

5.1 Selective Islands

The comment from Ross (1984) cited above could easily be framed in terms of initially puzzling pairs like (52) and (53), which involve adjunct and *wh*-islands, respectively.

(52) a.   ?Aldrich was a spy, which$_1$ the investigator balked before
            admitting (that he knew) t_1.
       b.   *Aldrich was a spy, as Op_1 the investigator balked before
            admitting (that he knew) t_1.
(53) a.   ?Aldrich was a spy, which$_1$ the investigator asked whether the
            press knew t_1.
       b.   *Aldrich was a spy, as Op_1 the investigator asked whether the press
            knew t_1.

Throughout, the extractee is the argument of *know* and seems to be a sentential proform. But if NRR extraction targets $\langle e \rangle$-type phrases, and *as*-clauses cannot, then the contrasts can be attributed to Cresti's (1995) island extraction filter (54), which finds it roots in the work of Cinque (1990) and Frampton (1991:sect. 5.2) and is given a syntactic interpretation in Postal 1998.

(54) a.   Only phrases of type $\langle e \rangle$ can escape islands.
       b.   *$[_{CP} [X [_{CP} \ldots]]]$, where X is not of type $\langle e \rangle$.

Specifically, only individual-level phrases escape islands because only they can respect the filter in (53b), in which X is adjoined to CP. Assuming, as Cresti does, that CP-adjunction is the only way to escape an island, we derive the contrasts in (51) and (52).

It is worth noting that Cresti's arguments for (54) are based on facts that are quite different from the ones at issue here. In particular, she aims to account for a range of interpretive contrasts involving *how many*–type questions in island contexts, contrasts usually explained by appeal to syntactic reconstruction. The above thus constitutes support for her filter from a partially distinct domain.

5.2 The Negative Island Issue

As noted, Ross's (1984) paper is largely devoted to the puzzling fact that NRR extractions easily span negative operators, whereas *as*-clauses seem unable to do so. His paper opens with the examples in (51), which involve anti-additive negations; as Szabolsci and Zwarts (1997) observe, the merely downward-entailing also tend to yield ill-formed *as*-clauses; see (55) (and also Ross 1984:(20)).

(55) a. *John is our hero, as you deny. (Szabolsci & Zwarts 1997:(40a))
     b.   John is our hero, which you deny.

Although I believe the account developed here can inform *as*-clauses' sensitivity to negation, I cannot address the issue in detail. Empirically, the most successful proposal is that of Szabolsci and Zwarts 1990 (reviewed in Szabolsci & Zwarts 1997:sect. 1–3), which says that the context separating *as* and its clause's gap cannot be downward entailing. It rightly predicts, for example, that a double negation corrects things, since the result is an upward-entailing context (e.g., *Ames was a spy, as no one* {**believes*/*denies*}).

But in light of the many attested examples such as (56)–(57) it seems wrong to conclude that a narrowly grammatical (or semantically rigid) restriction is at work here, so the reasoning of section 5.1 is not properly extended to these cases.

(56)   "Now then: two plus two is four, as you well know. And, of course, it can be proved that two plus two is four. ... And, **as may not be quite so clear**, it can be proved that it can be proved that two plus two is four, as well."
      —George Boolos. 1998. Gödel's Second Incompleteness Theorem explained in words of one syllable. In *Logic, Logic, and Logic*, ed. R. Jeffrey, 411. Cambridge, Mass.: Harvard University Press.
(57)   "We don't have enough of it. Space. Not in the cities. Not on the land, and, as we don't need to tell you, not in the libraries."
      —Ad for University Microforms, quoted by Nicholson Baker in "Deadline," *The New Yorker*, July 24, 2000 (p. 49).

Similarly, Ross (1973:152, (v)) cites (58) as well formed.

(58) Even Mongolia is overcrowded, as few students will admit.

These cases possibly admit of a pragmatically based explanations. One might argue that (57) is fine because the *as*-clause amounts to *as you already know*, an upward-entailing context. When this implication is not present, the cases become deviant:

(59) a. *I ate cereal for breakfast, as I didn't need to tell you—the
          information is useless.
      b. *Sue and I are meeting on Monday, as we don't need to inform
          Ed—he's not coming.
      c. I ate cereal for breakfast, which I didn't need to tell you—the
          information is useless.

But (56) might demand a rather different approach. Like many such examples, it first sets up a positive context—using a positive *as*-clause—and then offers a counterpoint. See also (60) and (61), the latter my own concoction.

(60) "He was concerned at first that I might be (as he said) a spy for the
       competition (or possibly, **as he didn't say**, a government inspector),
       but I explained that I was just a journalist curious about famihi and,
       trusting soul, he relaxed."
       —David Quammen. 2000. One man's meat. *The Boilerplate Rhino*, p.
       135. New York: Scribner.
(61) George is tough, as is well known. But he is also lovable, as is not so
       well known.

The negative *as*-clauses in (56), (59), and (60) might be pragmatically licensed by the ones that precede them. Consider, for example, (61). Borrowing some of the terms in Szabolsci and Zwarts 1997 (pp. 236ff), one might say that the initial *as*-clause—*as is well known*—denotes the set of propositions that are well known. This set is thus made salient. When the second *as*-clause—*as is not well known*—arrives, this salient set can be inspected exhaustively, to make sure the proposition corresponding to *George is lovable* isn't in it. Absent the invocation of the uttered propositions one is left to search the much larger set of sets of worlds incompatible with what's well known.

This does not explain why negative NRRs do not require contextualization. But these data greatly clarify the empirical situation. For instance, we see that structurally isomorphic examples such as (59) can contrast. This should inform future theorizing, suggesting in particular that a syntactic account is unlikely to be correct. The current proposal, in which NRR variables are individuals and *as*-clause variables are propositions, seems therefore to provide a promising starting point (see also Kuno & Takami 1994).[18]

[18] A reviewer observes that *as*-clauses and NRRs can be coordinated with each other, as in (i).

(i)   Ames was a spy, as the papers noted and which the FBI denied.

What is the type of the sentence *Ames was a spy*? On the present analysis, the *as*-clause requires it to be propositional, whereas the NRR requires it to be an individual. Thus, (i) seems to pose a grave difficulty. But it is more fruitful to view (i) as an indication that there exists a limited class of structures in which *as*-clauses can assume the type of NRRs. This could in turn inform an account of the puzzling cases of well-formed *as*-clause extraction over negation; it could be that

6. "Ignored" Negations

Chierchia (1984:48) suggests that the nominalization of propositions is explicitly linked to a filled complementizer node—*that* or *for* in English. For him, this provides a natural explanation for the obligatory presence of *that* in finite subject CPs (**Ali is tough stunned George*). I propose to follow Chierchia part of the way, with the restriction on CP nominalization in (62).

(62)   The nominalization operator $^{\cap p}$ can apply to a proposition *p* only in this structure (in which α is any syntactic category label):

$$\text{CP:}^{\cap p}(p)$$

$$\text{C:}^{\cap p} \qquad \alpha : p$$
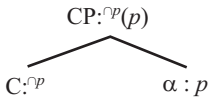
Thus, like Chierchia, I propose that $^{\cap p}$ cannot apply to anything but full clauses. But the evidence presented here suggests that $^{\cap p}$ applies to matrix clauses, both in NRR adjunctions and in clausal appositives like (42), so I am forced to deny that the distribution of *overt* complementizers is linked to the distribution of nominalized propositions (though complementizers can, of course, denote $^{\cap p}$).

A strong argument that this condition is operative begins with (63) which is ambiguous between the informal paraphrases of the *as*-clause in (63a,b).
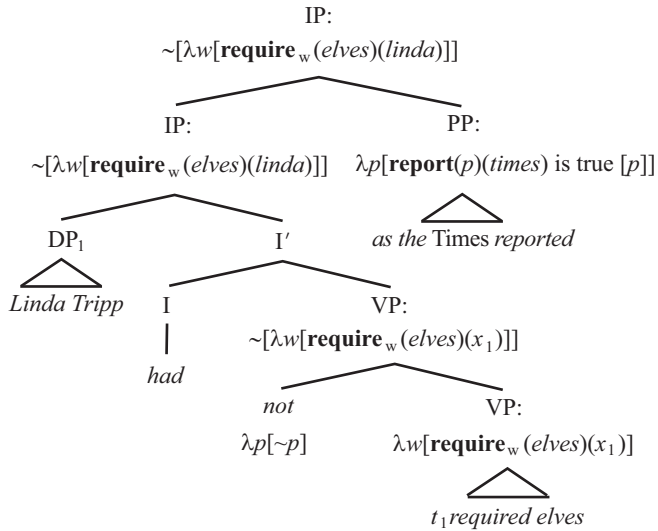
(63)   "I had found, in writing about the Starr Report and its accompanying volumes, proof that Linda Tripp had not required, as the *Times* kept reporting, a set of "elves," under the direction of the literary agent Lucienne Goldberg, to make her way, surreptitiously, and at the last minute, to the special prosecutor's office. She had, in fact, been working for that office for almost four years."
—Renata Adler, "A court of no appeal," *Harper's Magazine*, August 2000 (p. 75).
a.   *As*-clause = the *Times* kept reporting that Linda Tripp had not required a set of "elves" …
b.   *As*-clause = the *Times* kept reporting that Linda Tripp had required a set of "elves" …

In this case, the author makes fairly clear that (63b), in which the negation in the initial declarative is "ignored," is the intended interpretation. Potts (forthcoming) argues at length that this ambiguity, which exists also in (at least) German, Danish, and Thai, follows essentially from the lexical properties of *as*-morphemes: their only requirement is that an $\langle s, t \rangle$ function
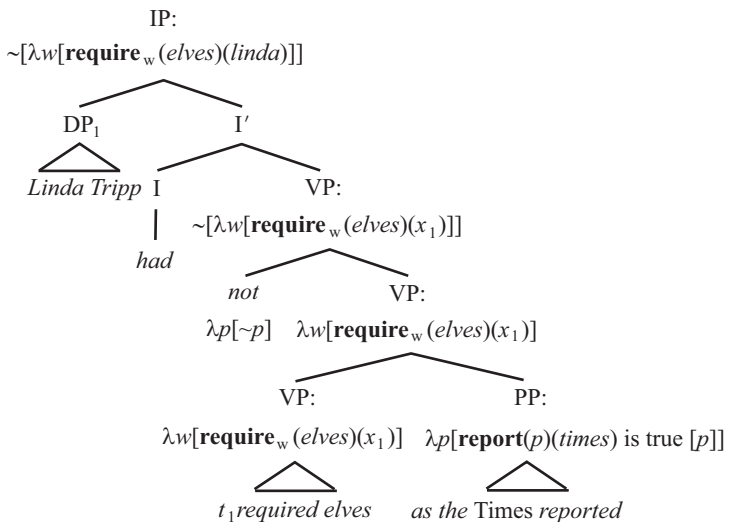
they involve *as*-clauses with NRR semantics. As noted elsewhere in this paper, Danish does not always draw a firm distinction between *as*-clauses and NRRs. This might occur in other languages as well. The negative-island contrasts (though not their source) might then reduce to the question of what conditions license *as*-clauses that denote in the domain of NRRs.

supply the meaning of their traces/variables. Given the VP-internal subject hypothesis, the VP is of the required semantic type. Thus, adjunction to it, which excludes *not*, yields the "nonnegated" (63b). Adjunction to the negation-containing IP yields (63a). The details of these two structures are given in (64) (with some simplifications).

(64)   Linda Tripp had not required a set of "elves," as the *Times* reported.

   a.   *As*-clause = the *Times* reported that Linda Tripp had *not* required a set of "elves" . . .

IP:
$\sim[\lambda w[\mathbf{require}_w(elves)(linda)]]$

IP:
$\sim[\lambda w[\mathbf{require}_w(elves)(linda)]]$

PP:
$\lambda p[\mathbf{report}(p)(times)$ is true $[p]]$

as the Times *reported*

DP_1

Linda Tripp

I′

I

had

VP:
$\sim[\lambda w[\mathbf{require}_w(elves)(x_1)]]$

not
$\lambda p[\sim p]$

VP:
$\lambda w[\mathbf{require}_w(elves)(x_1)]$

t_1*required elves*

   b.   *As*-clause = the *Times* reported that Linda Tripp had required a set of "elves" . . .

IP:
$\sim[\lambda w[\mathbf{require}_w(elves)(linda)]]$

DP_1

Linda Tripp

I′

I

had

VP:
$\sim[\lambda w[\mathbf{require}_w(elves)(x_1)]]$

not
$\lambda p[\sim p]$

$\lambda w[\mathbf{require}_w(elves)(x_1)]$

VP:
$\lambda w[\mathbf{require}_w(elves)(x_1)]$

t_1*required elves*

PP:
$\lambda p[\mathbf{report}(p)(times)$ is true $[p]]$

as the Times *reported*

The crucial observation is that NRRs are incapable of this flexibility. They permit only strict—"negated"—readings:

(65) Linda Tripp had not required a set of "elves," which the *Times* reported.
   a.   NRR = the *Times* reported that Linda Tripp had not required a set of "elves" …
   b.   NRR ≠ the *Times* reported that Linda Tripp had required a set of "elves" …

The impossibility of (64b) follows from the restriction on $^\cap p$ in (62) and the claim that nonnegated readings require adjunction to VP, the only proposition-denoting phrase that excludes the negation. By (62), $^\cap p$ cannot apply to this proposition (appear adjoined at this point):[19]

(66)
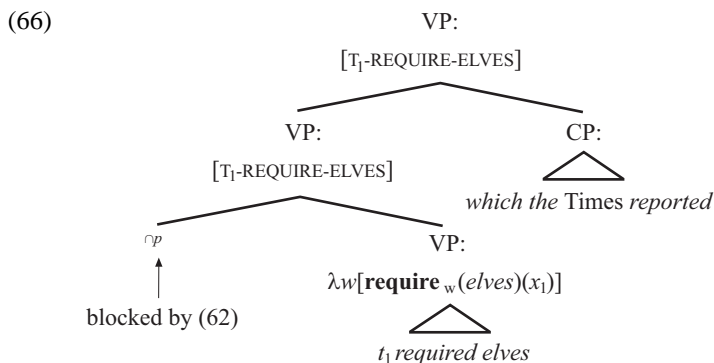
This ambiguity does not hinge on negation per se, only on the syntactic position of the negative operator. As reviewed in Potts, forthcoming, this rightly predicts that any VP external operator—a modal operator, tense information, and various adverbials—can be excluded from *as*-clause interpretation. NRRs, however, cannot ignore (adjoin under) any of them, simply because doing so leaves them no composition scheme.

Principle (62) can also be fruitfully applied to the contrast between (67) and (68), in which negation *is* the crucial factor in fostering the *as*-clause ambiguity. (See Potts, forthcoming, for attested instances of this interpretive freedom, from English as well as German.)
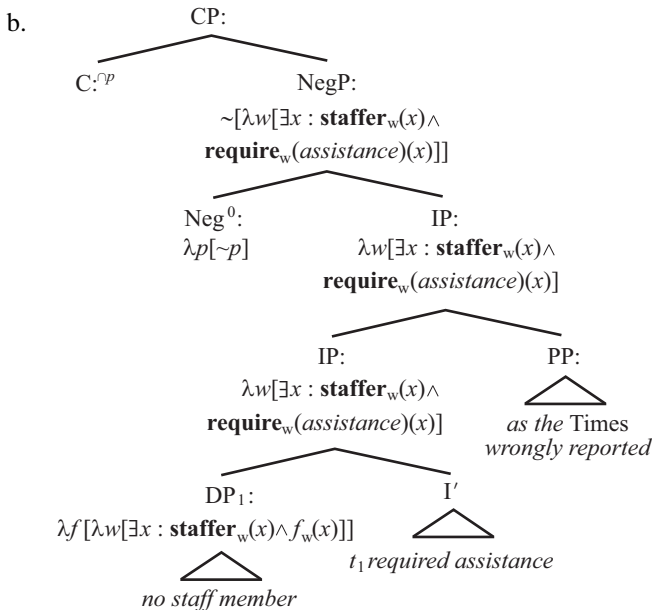
[19] At present, I do not have an explanation for this restriction. However, its source might be found in the fact that the restriction has the effect of limiting nominalization to constituents that contain all the tense, event operators, and so forth associated with the clause, whereas the VP probably excludes many of these elements.

(67) No staff member required assistance, as the *Times* (wrongly) reported.

    a. *As*-clause = the *Times* reported that no staff member required assistance

    b. *As*-clause = the *Times* reported that a staff member required assistance

(68) No staff member required assistance, which the *Times* (wrongly) reported.

    a. NRR = the *Times* reported that no staff member required assistance

    b. NRR ≠ the *Times* reported that a staff member required assistance

To extend the above analysis to this ambiguity, *no staff member required assistance* must house a function that contains the information in the subject's restriction but excludes the negative force of its determiner. To achieve this, Potts (forthcoming) adapts Ladusaw's (1992, 1996) proposal that negative determiners (*no* and its anti-additive brethren, and only them) are optionally indefinites, "roofed" by an abstract negation in a clause level NegP. So the ambiguity of (67) is also one of adjunction.

To derive the lack of such nonnegated readings from principle (62) we need only adopt a structure such as (69). (Following Ladusaw, I assume that the indefinite realization of *no* is licensed by the negation in Neg^0 in the manner of a negative polarity item.)

(69) No staff member required assistance, as the *Times* (wrongly) reported.

    a. *As*-clause = the *Times* reported that a staff member required assistance ("nonnegated" reading)

    b.

CP:

C:$^{\cap p}$ NegP:

$\sim[\lambda w[\exists x : \textbf{staffer}_w(x)\wedge \textbf{require}_w(assistance)(x)]]$

Neg^0: IP:
$\lambda p[\sim p]$ $\lambda w[\exists x : \textbf{staffer}_w(x)\wedge \textbf{require}_w(assistance)(x)]$

IP: PP:
$\lambda w[\exists x : \textbf{staffer}_w(x)\wedge \textbf{require}_w(assistance)(x)]$ *as the* Times *wrongly reported*

DP$_1$: I′
$\lambda f[\lambda w[\exists x : \textbf{staffer}_w(x)\wedge f_w(x)]]$ t_1 *required assistance*

no staff member

The unique locus of nominalization is the C^0 node, which dominates Neg^0. Thus, there is no function that both excludes the negation and provides a suitable argument for an NRR. Principle (62) is not flexible enough to accommodate such a structure. Thus, finally, we've found an area in which *as*-clauses are the privileged appositives (where non-individual-hooded-ness is a virtue).

7. Niching Restrictions

Although restriction (62) on the nominalization of propositions' is well supported by the semantics, it would be good to find syntactic motivation, because (61) references a specific structure. Such evidence is forthcoming, as reviewed in this section.

Most of the (mainly) syntactic phenomena discussed above reveal limitations on *as*-clauses that NRRs are free from. But the reverse obtains in the realm of "niching," Ross's (1973, 1984) term for the sprinkling of parentheticals between major constituents. Ross (1984) points out in particular that only *as*-clauses niche, citing examples like (70) and (71).

(70) a.   This mist blinded, as Morpho said, *(many hard-pedaling) unicyclists.
      b.   *This mist blinded, which Morpho said, (many hard-pedaling) unicyclists.
(71) a.   That this mist can't last, {as/which} Morpho realizes, is self-evident.
      b.   That this mist, {as/*which} Morpho realizes, can't last, is self-evident.

The German niching restrictions are entirely parallel:

(72) Diese Kartoffeln, {wie/*was} Helmut gesagt hat, sind lecker und
      these potatoes   as/which Helmut said   has are tasty   and
      gesund.
      healthy
      'These potatoes, {as/*which} Helmut said, are tasty and healthy.'

The contrast shows up in Danish as well, though it is apparently less robust, as indicated in (73). Again, this might be related to the use of *som* as a relative pronoun (see note 11).

(73) a.   Det her regnvejr   kunne, som Morpho har indset,   vare hele
           this here rainweather could as   Morpho has realized last all
           weekenden.
           weekend.DEF
           'This rain could, as Morpho realizes, last the weekend.'

   b. ??Det her regnvejr   kunne, hvilket Morpho har indset, vare
      this here rainweather could   which Morpho has realized last
      hele weekenden.
      all   weekend.DEF
      'This rain could, which Morpho realizes, last all weekend.'

An available structure for (70a) is that in (74), in which the *as*-clause is left adjoined to the lower VP, the direct object of *blind* having undergone *heavy shift* (hence the "heaviness" requirement evident in the obligatory modification in (70a)).

(74)
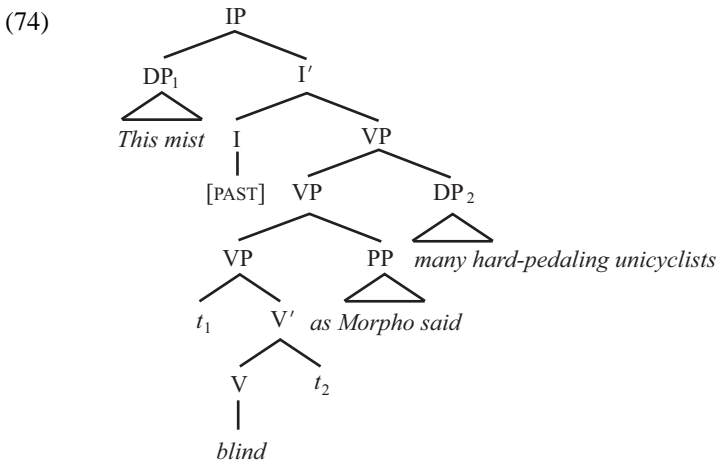
A comparable structure for *which* is impossible because the VP is not a licit adjunction site. In sum, the proposals so far allow NRRs to appear only clause finally or clause initially, since all proposition-denoting phrases in the clause, save the highest one, are off limits to nominalization. This imparts to NRRs a bit too much freedom, however: clause-initial adjunction is impossible, though it satisfies the semantic requirements of the NRR:

(75) {As/*Which} they claimed, Alger was a spy.

But the failure with *which* in (75) is arguably not specific to *clausal* NRRs. It reflects a restriction on left-adjunction of an NRR of any sort. This explanation presupposes a unified treatment of NRRs, whether syntactically of the CP-, VP-, or DP-modifying sort. Section 8 motivates this unification.

8. A Unified Treatment of NRRs

I've so far ignored predicate NRRs and *as*-clauses such as those in (4) and (76), though section 1 promises that Ross's observations hold of them as well.

(76) a. Ali was energized, as his trainer (suggested that he) might be.
　　 b. Ali was energized, which his trainer (suggested that he) might be.

　　This section attempts to fulfill the promissory note and in fact extend it to DP modifying NRRs. The central claim is (77).

(77) NRR gaps are of type $\langle e \rangle$ (whether the NRR is CP, VP-, or DP-modifying).

　　For DPs, (77) is motivated by their failure to combine with quantified expressions, which denote sets of properties (extensionally, type $\langle \langle e,t \rangle, t \rangle$). The following are based on examples from McCawley 1998 (p. 451):

(78) a. *Susan interviewed every senator, who is crooked.
　　 b. *Most people, who know everything, are perfect.

　　It is possible to enforce (77) for predicate-level NRRs by assuming that they have the lexical meaning in (79), which parallels the denotation (10).

(79) **which**$_{Predicate}$ = $\lambda F[\lambda x^f : F(x^f)$ is true $[x^f]]$

　　The variable x^f is an individual variable of the property sort. This function takes a set of properties as its first argument, returning a partial identity function on nominalized properties (the *kinds* of Chierchia 1998). In this case, we can borrow the nominalizing function directly from Chierchia (1998:sect. 2.3), as in (80). I illustrate in (81).

(80) If $f \in D_{\langle s, \langle e, t \rangle \rangle}$, then $^\cap f(f) = \lambda w[\iota x^f \in w : \forall\, y \in f : y \leq x^f]$
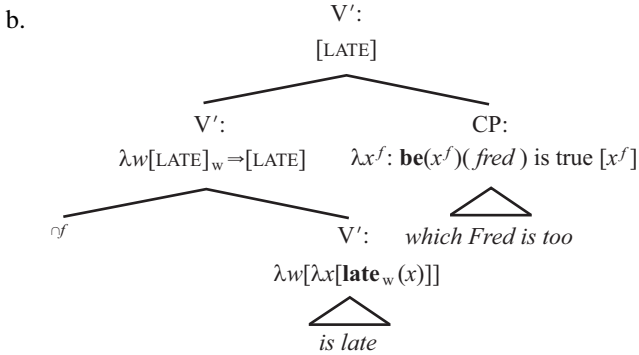
(81) a. $\lambda w[\lambda x[\textbf{tough}_w(x)]] =$
　　　　 $\{\langle w_1, \{ali, george, hubert\}\rangle, \langle w_2, \{chuck, frank\}\rangle, \langle w_3, \{ali, hubert\}\rangle\}$
　　 b. $^\cap f(\lambda w[\lambda x[\textbf{tough}_w(x)]]) =$
　　　　 $\{\langle w_1, ali \oplus george \oplus hubert\rangle, \langle w_2, chuck \oplus frank\rangle, \langle w_3, ali \oplus hubert\rangle\}$

　　Empirical support for this denotation derives from the same phenomena employed earlier to motivate the denotations for clausal NRRs and *as*-parentheticals. For instance, predicate-*as*-clause extraction is maximally island sensitive, whereas predicate-NRRs can escape with only mild unacceptability:

(82) a. *He said he fixed the car, (just) as Op_1 they had asked whether he would t_1.
　　 b. He said he fixed the car, which$_1$ they had asked whether he would t_1.

If Cresti's principle (54) is valid, then (82b) involves extraction of an entity-level expression, whereas (82a) does not. An $\langle e \rangle$-type gap is in fact required by (79). The $^\cap f$ function, combined with a shift from the intensional to extensional domains (here $\langle s, e \rangle$ to $\langle e \rangle$) provides an argument of the required type:[20]

(83) a.   Ali is late, which Fred (commonly) is too.

b.

```
                              V′:
                            [LATE]
            ┌──────────────────┴──────────────────┐
          V′:                                     CP:
  λw[LATE]_w ⇒ [LATE]           λx^f: be(x^f)( fred ) is true [x^f]
    ┌───────┴────────┐                    ╱‾‾‾‾‾‾‾‾‾╲
   ∩f              V′:                  which Fred is too
                λw[λx[late_w(x)]]
                  ╱‾‾‾‾‾╲
                  is late
```

In contrast, the denotation for predicate-*as*-clauses in (84), from Potts, forthcoming, does not allow such gaps to have $\langle e \rangle$-type denotations. The gap must denote a property; if it shifts by $^\cap f$, the result cannot compose with the meaning of *as*.

(84) a.   **as**$_{Predicate}$ = $\lambda F[\lambda f : F(f)$ is true $[f]]$
       b.   *as Ringo might t* ⤳ $\lambda f :$ **might**$(f)(ringo)$ is true $[f]$

For now, I place no restriction on the adjunction of this nominalization function. But one might want to restrict it to the V′-level, the lowest verbal property-denoting expression in a clause. This would be in harmony with Chierchia's (1984) claims that inflected VPs denote properties, whereas uninflected ones denote individuals, and also seems supported by VP preposing. Consider the data in (85) and (86), the latter provided by Christopher Kennedy (p.c.).

(85) a.   [Fix the car]$_1$, I wonder whether he will t_1. (Chomsky 1986:20)
       b.   They said it would be easy, but [easy]$_1$, I wonder whether it really will be t_1.
(86) a.   Max said he would drink ten pints of beer, and {drink/*drunk} ten pints of beer he has.
       b.   Max has {*drink/drunk} ten pints of beer.

---

[20] French *le*-pronominalization of predicates might further support these proposals. Such pronominals can extract from some selective islands. This, combined with their apparently nominal character, suggests that they too involve predicates denoting in $\langle e \rangle$, via a shift using $^\cap f$.

In (85), VP-preposing shows some island-escaping abilities; this is consistent with Cresti's principle only if VP-preposing involves nominalization. If this is correct, then the impossibility of a participle form in the preposed VP in (86) would follow from the claim that nominalization occurs too low in the structure to include these morphological features.

So, a treatment of VP-level NRRs and *as*-clauses as kin to the clausal types seems correct. The unifying statement in (77) is actually a theorem, given the denotations offered above for NRR-extractees plus the assumption that NRRs associated with DPs adjoin to the DP itself (which view accounts for why *the dog, which I love*, . . . presupposes a unique dog [loved or unloved by me]; cf. *the dog that I love* . . .).

An additional principle is required, however, to block the niching of predicate-NRRs. This is uniformly impossible. As usual, *as*-clauses are, in contrast, highly nichable:[21]

(87) a.   Joan might, {as/*which} Bill said he could, learn to hang glide.
      b.   Joan, {as/*which} they said, understands that the sport is
           dangerous.

But this kind of niching requires left-adjunction to V′. Although semantically impeccable, this evidently violates a general condition on NRRs, one already suggested by (75), above, repeated in (88) along with support at the DP level.

(88) a.   {As/*Which} they claimed, Alger was a spy.
      b.   *Who they rejected, Ali gave me a bit of advice.

It seems that, in light of these cases, one must simply state (89).

(89) NRRs cannot left-adjoin.

In closing, I note that predicate-NRRs and predicate-*as*-clauses do not, as their clausal counterparts were seen to in section 6, part company with regard to interpretive possibilities in the presence of a negation and other operators. Since both are VP modifiers, ignoring VP external negations is trivial for

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[21] One surprising thing under my account is that it is rare to find NRRs adjoined to VPs out of which something has moved by heavy shift. These are attested but unusual:

(i)   "'I'd have a better chance of winning the MegaBucks lottery,' Miles said, sliding the platter onto the counter **and noticing, which he hadn't for a long time, the purple fibroid cyst that grew out of Horace's forehead**."
      —Richard Russo. 2001. *Empire Falls*, p. 21. New York: A. A. Knopf.

In (i), the NRR is right adjoined to the V′. Interpretation requires either that the assignment function map the variable created by movement of *the . . . cyst . . .* to the entity that *the . . . cyst . . .* denotes, or else that the heavy-shifted nominal is reconstructed to complement position.

both. Less trivial is the fact that both can ignore the negation in an object position negative DP:

(90) a.   "There was nothing of the show-off in these soliloquies, as there often was in his public performances."
           —Daniel Aaron. Northampton. *The American Scholar*, Spring 2001:77.
      b.   There was nothing of the show-off in these soliloquies, which there often was in his public performances.

But the lack of an asymmetry here is expected, given that the negation associated with *nothing* can be realized at the CP level. The V′, nominalized or not, can thus exclude this negation.

9. Conclusion

In its particulars, this paper is an extended argument for a single, specific contrast in the semantics of NRRs and *as*-clauses—one that has far-reaching consequences for the distributional and interpretive properties of the two classes of expression. In short, NRRs target ⟨*e*⟩-type expressions, whereas *as*-clauses aim only for properties and propositions (depending on the internal syntax of the clause).

In general, a major theoretical point of this paper is that the lexical semantics of particular (types of) morphemes can interact with general principles, both syntactic and semantic, to account for phenomena that appear initially to be quite disparate. Additionally, the behavior of NRRs and the interpretive demands of equative constructions together make a strong case for a view of propositions (sets of worlds) as, in certain cases, individuals of a worldly sort.

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