Perfect and Imperfect Nominals

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Abstract

A modeltheoretic account of Vendler's distinction between perfect and imperfect nominals and their respective verbal containers is presented. The technical tools used combine a type-free intensional approach with a Davidsonian event theory. The main purpose of the present paper is to give an ontologically sparser reconstruction of Vendler's observations than Zucchi [1993] and to improve on some technical points.

Contents

1 Vendler on Nominalization

In chapter five of *Linguistics in Philosophy*, Zeno Vendler discusses two classes of nominalized predicates, the class of perfect and the class of imperfect nominals, and further two classes of verbal contexts which are sensitive to these nominals. In the following two sections, I shall introduce the most important characteristics of the notions involved without, however, giving a detailed empirical or philosophical justification for them. A much more adequate discussion of these issues can be found in Vendler [1967,1968].

1.1 Perfect and Imperfect Nominals

Vendler's differentiation between perfect and imperfect nominals and his observations about their most important properties are illustrated in (1) and (2). Perfect nominals like those in (1) occur with determiners, can be modified by adjectives but not by adverbs, and can appear in different tenses or be modalized. Further, it is impossible to negate perfect nominals. To summerize, perfect nominals are nominalized forms which have lost their verbal characteristics and behave like "real" nouns. This is why Vendler dubbed them perfect.

(1) a. The singing of the song.
   b. beautiful singing of the song.
   c. *quickly cooking of the dinner.
   d. *having cooked of the dinner.
   e. *being able to cook of the dinner.
   f. *not revealing of the secret.

Imperfect nominals show the opposite behaviour, as the examples in (2) demonstrate. They cannot occur with determiners, they can be modified by adverbs but not by adjectives, they can occur in different tenses or be modalized, and it is possible to negate them.

(2) a. *The singing the song.
   b. *beautiful singing the song.
   c. Singing the song beautifully.
   d. quickly cooking the dinner.
   e. having cooked the dinner.

f. being able to cook the dinner.
g. not revealing the secret.

So, imperfect nominals can occur externally in noun phrase positions, but their internal structure strongly resembles the structure of the VP or the S they are derived from. This is, of course, the reason why Vendler called them imperfect. From a semantic point of view, it is tempting to think that the internal logic of the imperfect constructions is also richer than that of the perfect nominals. I shall comment on this point in the final paragraph. I shall henceforth use the term *perfect nominal* both for the respective nominal and for the NP which contains a perfect nominal.

Abney [1987] develops a detailled syntactic account of gerunds, of which the class of perfect and imperfect nominals forms a part. He distingishes four classes of gerunds:

(3) a. Acc-ing: John being a spy.
b. PRO-ing: singing loudly.
c. Poss-ing: John's knowing the answer.
d. Ing-of: singing of the song.

Assuming that PRO-ing is a special case of Acc-ing or Poss-ing, there are three classes of gerunds, which differ with respect to their syntactic properties. For example, Abney shows that Acc-ing and Poss-ing constructions show differences with regard to agreement, long distance binding, pied piping, etc.. But what about semantic differences? Of course, Ing-of gerunds and Poss-ing gerunds are precisely the perfect and imperfect nominals introduced in this section, and Vendler's thesis is (see next section) that there is a category distinction, i.e. something genuinely semantic, involved with these notions. In this paper it will be assumed that Acc-ing and Poss-ing constructions are semantically in the same class, the class of imperfect nominals. Not distinguishing the semantics of these gerunds may, however, prove problematic if one wants to give a semantic account of the distributional properties of sentential adverbs versus VP-adverbs because sentential adverbials are possible with Acc-ing gerunds but are bad with Poss-ing gerunds[1].

(4) a. John probably being a spy, Bill thought it wise to avoid him.
b. *John's probably being a spy made Bill think it wise to avoid him.
c. John fortunately knowing the answer, I didn't fail the test.

[1] The first example is from Reuland [1983] the other are from Abney [1987]

d. * John's fortunately knowing the answer kept me from failing.

Jespersen [1933, § XXXI], however, cites plenty of examples which show that the assignment of genitive case versus common case is highly dependent on a lot of morphosyntactic phenomena. Therefore, the chance to semantically account for the above mentioned distribution of sentential adverbs is slight.

1.2 Narrow and Loose Containers

Vendler also considers verbal contexts, which somehow discriminate between the above two classes of nominals. Expressions like *surprised us, is unlikely* are examples of loose containers. Their name derives from the fact that they accept both kinds of nominals as arguments as is shown in (5).

(5) a. The beautiful singing of the aria surprised us.
b. John's not revealing the secret is unlikely.
c. The singing of the song is fun.
d. John's quickly cooking the dinner surprised us.
e. They were surprised by the sudden coming in of a stranger.[2]
f. They were surprised by a stranger coming in suddenly.

Verbal contexts like *was slow, occurred*, etc. which are called narrow by Vendler, show a more restrictive behaviour. They accept only perfect nominals as is shown in (6).

(6) a. *The soprano's singing the aria was slow.
b. The soprano's singing of the aria was slow.
c. John's revealing of the secret occurred at midnight.
d. *John's revealing the secret occurred at midnight.
e. *John's not revealing the secret occurred at midnight.

Note that the nominals *arrival of the train* and *non-arrival of the train* in the following examples, though similar to the perfect and imperfect nominals, respectively, nevertheless behave differently. It may well be that *arrival of the train* is a perfect nominal, but *non-arrival of the train* is not an imperfect nominal in Vendler's sense because it can occur with determiners.

[2] This example is from Jespersen [1933,p 327]

(7) a. The arrival of the train surprised us.
b. The non-arrival of the train surprised us.
c. The arrival of the train occurred at noon.
d. *The non-arrival of the train occurred at noon.

Narrow containers are typical examples for extensional contexts in contrast to loose containers[3].

(8) a. The beheading of the tallest spy occurred at noon.
b. The beheading of the tallest spy surprised us.

If the king and the tallest spy happen to be the same person, then it follows from (8)(a) that *The beheading of the king occurred at noon* . But certainly *The beheading of the king surprised us* does not follow from (8)(b).

Vendler suggests that an ontological category distinction between events and facts or results forms the philosophical basis for these empirical findings. Events are taken to somehow be related to the meaning of perfect nominals, and facts or results to the meaning of imperfect nominals. I think it is fair to interpret Vendler as claiming that the relationship between the nominals and their respective containers is determined by this category distinction, but it is certainly open whether he wants the other findings to be interpreted in this way or as conditioned by structural (i.e. syntactic) properties of English. I shall return to the discussion of this topic in the last paragraph.

The following observations from Abney [1987, pp 244] show that perfect and imperfect nominals also differ in their ability to participate in N-bar deletion. For instance, an ellipsis with a Poss-ing construction as in (9)(a) is bad, while it is possible with an Ing-of gerund and a narrow container as is shown in (9)(b).

(9) a. *John's fixing the sink was surprising, and Bill's was more so.
b. John's fixing of the sink was skillful, and Bill's was more so.

Abney claims that the gerund *John's fixing of the sink* is ambiguous and can either refer to the manner in which John fixed the sink - called the Act-reading by Abney - or the fact that John fixed the sink (Fact-reading). N-bar deletion is only possible under the Act-reading.

[3]The examples are from Parsons [1990]

(10) a. John's fixing of the sink was skillful, and Bill's was more so.
b. *John's fixing of the sink was surprising, and Bill's was more so.

Observe that Poss-ing gerunds don't have Act-readings. According to Vendler this is the reason why they cannot occur as arguments of narrow containers.

(11) a. *John's fixing the sink was skillful.
b. John's fixing the sink was surprising.

The contrast in (9) is now explained, because (9)(a) allows only a Fact-reading, but the gerund in (9)(b), being ambiguous, allows for an Act-reading. So, the above-mentioned category distinction is useful for offering an explanation for these facts. Further, Abney's observations go well with Vendler's claim that perfect nominals tend to be interpreted as facts or results when they occur as arguments of loose containers and as events when they function as arguments of narrow containers.

In this paper only the Act- and Fact-readings of gerunds are considered. The habitual reading of a gerund like *eating apples* will be neglected[4].

2 The Formal System

In this section a formal system is presented which is based on Feferman [1984, §13]. I shall follow Feferman and develop the theory in two steps. The first step consists in the description of a theory $\mathcal{T}$, formulated in a formal language $\mathcal{L}$, with a naming device, which is taken to be unproblematic in the following sense: It is assumed that there exists a model $\mathcal{M}$ for $\mathcal{T}$.

In the second step this theory will be extended to a theory $\mathcal{TN}$ by adding a predication relation to $\mathcal{L}$ and comprehension axioms to $\mathcal{T}$.

2.1 The Basic System

The syntax and semantics of $\mathcal{L}$ are based on Feferman's system S_0, which I shall describe briefly (for details, compare Feferman [1984, §9] or Moschovakis [1974, chapter 5]). Apart from the standard vocabulary of first-order languages, it is assumed that S_0 also contains a constant $\bar{0}$, a binary operation

[4] See Portner [1991] for a discussion of such examples.

symbol P, and k-ary operation symbols P_i^k $(1 \leq i \leq k)$. It is required that P acts as a *pairing* operation in S_0. Therefore, it is assumed that the following formulas are provable in this system:

a. $P(x, y) \neq \bar{0}$

b. $P_1^2(x, y) = x \wedge P_2^2(x, y) = y$

Thus, if M_0 is the domain of a model for S_0, then the interpretation of P serves as a pairing operation from M_0^2 into M_0. The operations associated with P_1^2 and P_2^2 act as the corresponding *projection* operations. It is well known that a part of the natural number structure can be represented with the aid of these operations. Tuples are then introduced recursively, and the P_i^k $(1 \leq i \leq k)$ act as the corresponding projection operations which satisfy $P_i^k(x_1, ..., x_k) = x_i$. With this machinery a naming device for the corresponding language can be introduced via *Gödelization*.

For the languages considered below, I shall write $^{\cap}\phi$ for the name or the *numeral* corresponding to the expression ϕ. A reverse operation $^{\cup}\phi$ could also be introduced because Gödelizations are injective. But I shall not do this here because such an operation is not necessary for the examples discussed in this paper. Further, π will be that injective function which associates with every expression ϕ an element of the universe of discourse, the *number* that is assigned to ϕ under the Gödelization and the interpretation of the respective numeral in the structure. Finally, N will be that subset of the universe which is the image of the language under π, i.e., $\pi[L] = N \subset M$. N will be called the set of *codes* for L.

The Syntax of $\mathcal{L}$

Definition 1: The set of $\mathcal{L}$-terms.
(T1) Every variable is an $\mathcal{L}$-term.
(T2) Every constant is an $\mathcal{L}$-term.
(T3) If ϕ is an $\mathcal{L}$-term or an $\mathcal{L}$-formula, then $^{\cap}\phi$ is an $\mathcal{L}$-term.
The set of $\mathcal{L}$-terms is denoted by $Term$.

$\mathcal{L}$ also contains a set of determiners.

Definition 2: The set of determiners $Det = \{Every, Some\}$

Other determiners could be included, but will not be considered here. But note that non-monotone determiners like *exactly one* may cause problems for the extension mechanism of the next section because the model for this extension is constructed as a fixpoint for a monoton semantic system.

Definition 3: The set of $\mathcal{L}$-formulas.
(F1) If R is an n-place relation constant and t_1, ... ,$t_n \in Term$, then $R(t_1, ..., t_n)$ is an $\mathcal{L}$-formula.
(F2) If t_1, t_2 are terms, then $(t_1 = t_2)$ is an $\mathcal{L}$-formula.
(F3) If ϕ, ψ are formulas, then $\neg\phi$, $(\phi \wedge \psi)$, and $(\phi \vee \psi)$ are $\mathcal{L}$-formulas.
(F4) If ϕ and ψ are formulas, x a variable, and Q a determiner, then $Qx(\phi)(\psi)$ is an $\mathcal{L}$-formula.
The set of $\mathcal{L}$-formulas is denoted by $Form$.

The connectives $\rightarrow, \leftrightarrow$ are assumed to be defined in the usual way.

The Semantics of $\mathcal{L}$

A structure $\mathcal{M}$ for $\mathcal{L}$ is a triple (M, V, π), where M is a nonempty set (the universe of discourse), V interprets the non-logical vocabulary of $\mathcal{L}$, and π is as above. Let g be an assignment for the variables of $\mathcal{L}$. The assignment $g[x/a]$ is the same as g, apart for the value of x, which is $a \in M$.

Definition 4: Semantics of $\mathcal{L}$-terms.
(ST1) $[\![x]\!]^{\mathcal{M},g} = g(x)$ if x is a variable.
(ST2) $[\![c]\!]^{\mathcal{M},g} = V(c)$ if c is a constant.
(ST3) $[\![{}^{\cap}\phi]\!]^{\mathcal{M},g} = \pi(\phi)$.

Definition 5: Semantics of $\mathcal{L}$-determiners.
(SQ1) $[\![Every]\!]^{\mathcal{M},g}$ = the function **Every** such that for every $A, B \subseteq M$, $\mathbf{Every}(A) = \{B; A \subseteq B\}$.
(SQ2) $[\![Some]\!]^{\mathcal{M},g}$ = the function **Some** such that for every $A, B \subseteq M$, $\mathbf{Some}(A) = \{B; A \cap B \neq \emptyset\}$.

Definition 6: Semantics of $\mathcal{L}$-formulas.
(SF1) $[\![R(t_1, ..., t_n)]\!]^{\mathcal{M},g} = 1$ iff $([\![t_1]\!]^{\mathcal{M},g}, ..., [\![t_n]\!]^{\mathcal{M},g}) \in V(R)$.
(SF2) $[\![(t_1 = t_2)]\!]^{\mathcal{M},g} = 1$ iff $[\![t_1]\!]^{\mathcal{M},g}$ equals $[\![t_2]\!]^{\mathcal{M},g}$.
(SF3) $[\![\neg\phi]\!]^{\mathcal{M},g} = 1$ iff $[\![\phi]\!]^{\mathcal{M},g} = 0$.
(SF4) $[\![(\phi \wedge \psi)]\!]^{\mathcal{M},g} = 1$ iff $[\![\phi]\!]^{\mathcal{M},g} = 1$ and $[\![\psi]\!]^{\mathcal{M},g} = 1$.
(SF5) $[\![(\phi \vee \psi)]\!]^{\mathcal{M},g} = 1$ iff $[\![\phi]\!]^{\mathcal{M},g} = 1$ or $[\![\psi]\!]^{\mathcal{M},g} = 1$.
(SF6) $[\![Every\ x(\phi)(\psi)]\!]^{\mathcal{M},g} = 1$ iff
$\{a; [\![\phi]\!]^{\mathcal{M},g[x/a]} = 1\} \in [\![Every]\!]^{\mathcal{M},g}(\{a; [\![\psi]\!]^{\mathcal{M},g[x/a]} = 1\})$.
(SF7) $[\![Some\ x(\phi)(\psi)]\!]^{\mathcal{M},g} = 1$ iff
$\{a; [\![\phi]\!]^{\mathcal{M},g[x/a]} = 1\} \in [\![Some]\!]^{\mathcal{M},g}(\{a; [\![\psi]\!]^{\mathcal{M},g[x/a]} = 1\})$.

Dets are treated as functions on subsets of M, which yield sets of subsets of M. This is just one of the standard ways they are interpreted in generalized quantifier theory.

2.2 Extending the Basic System

In this section the language $\mathcal{L}$ will be extended to a Language $\mathcal{L}'$ by a set of predication relations pairs, and a corresponding set of comprehension axioms will then be added. First, the syntax of the basic system is extended by the following rule:

(F5) If $(Pred_k, Pred_k^-)$ is a new pair of k+1-nary relation constants and $t_1, ..., t_k, t_{k+1}$ are terms, then $Pred_k(t_1, ..., t_k, t_{k+1})$ and $Pred_k^-(t_1, ..., t_k, t_{k+1})$ are formulas.

The semantic rules corresponding to (F5) are:

(SF8) (a) $[\![Pred_k(t_1, ..., t_k, t_{k+1})]\!]^{\mathcal{M},g} = 1$ iff $([\![t_1]\!]^{\mathcal{M},g}, ..., [\![t_{k+1}]\!]^{\mathcal{M},g}) \in V(Pred_k)$.
(b) $[\![Pred_k^-(t_1, ..., t_k, t_{k+1})]\!]^{\mathcal{M},g} = 1$ iff $([\![t_1]\!]^{\mathcal{M},g}, ..., [\![t_{k+1}]\!]^{\mathcal{M},g}) \in V(Pred_k^-)$.

Notational convention 1: Let $\phi(x_1, ..., x_k, y_1, ..., y_n)$ be a formula of $\mathcal{L}'$ with free variables among $x_1, ..., x_k, y_1, ..., y_n$, then $\hat{x}_1...\hat{x}_k\phi(y_1, ..., y_n)$ is written for the tupel $({}^{\cap}\phi, y_1, ..., y_n)$. The $x_1, ..., x_k$ are considered bound variables and $y_1, ..., y_n$ parameters of $\hat{x}_1...\hat{x}_k\phi(y_1, ..., y_n)$.

The next step is to define inductively the set of *positive* formulas over $\mathcal{L}$, which is the following subset of the set of $\mathcal{L}'$-formulas.

Definition 7: Formulas ϕ^+ and ϕ^- are defined inductively.
(P1) $\phi^+ = \phi$ for all atomic ϕ.
(P2) If ϕ is $\mathcal{L}$-atomic, then $\phi^- = \neg\phi$.
(P3) (a) If $\phi = Pred_k(t_1, ..., t_{k+1})$, then $\phi^- = Pred_k^-(t_1, ..., t_{k+1})$.
(b) If $\phi = Pred_k^-(t_1, ..., t_{k+1})$, then $\phi^- = Pred_k(t_1, ..., t_{k+1})$.
(P4) (a) $(\neg\phi)^+ = \phi^-$.
(b) $(\neg\phi)^- = \phi^+$.
(P5) (a) $(\phi \wedge \psi)^+ = \phi^+ \wedge \psi^+$.
(b) $(\phi \wedge \psi)^- = \phi^- \vee \psi^-$.
(P6) (a) $(\phi \vee \psi)^+ = \phi^+ \vee \psi^+$.
(b) $(\phi \vee \psi)^- = \phi^- \wedge \psi^-$.
(P7) (a) $(Every\ x(\phi)(\psi))^+ = Every\ x(\phi^+)(\psi^+)$.
(b) $(Every\ x(\phi)(\psi))^- = Some\ x(\phi^+)(\psi^-)$.
(P8) (a) $(Some\ x(\phi)(\psi))^+ = Some\ x(\phi^+)(\psi^+)$.
(b) $(Some\ x(\phi)(\psi))^- = Every\ x(\phi^-)(\psi^-)$.

One may also think of a positive formula as one which is equivalent to a formula built up of atomic and negated atomic $\mathcal{L}$-formulas without $\neg$. The next set of axioms says that the interpretations of $Pred_k$ and $Pred_k^-$ are disjoint.

Dis

$$\neg(Pred_k(t_1, ..., t_k, t_{k+1}) \wedge Pred_k^-(t_1, ..., t_k, t_{k+1}))$$

Lemma 1: The set of axioms in Dis implies $(\phi^+ \rightarrow \phi)$ and $(\phi^- \rightarrow \neg\phi)$ for each ϕ.

Finally, the comprehension axioms are added to the system.

Comp

$$Pred_k(t_1, ..., t_k, \hat{x}_1...\hat{x}_k\phi(y_1, ..., y_n)) \leftrightarrow \phi^+(t_1, ..., t_k, y_1, ..., y_n)$$
$$Pred_k^-(t_1, ..., t_k, \hat{x}_1...\hat{x}_k\phi(y_1, ..., y_n)) \leftrightarrow \phi^-(t_1, ..., t_k, y_1, ..., y_n)$$

In Feferman [1984, §11 -13] it is shown by a fixpoint construction that a model $\mathcal{M}'$ exists for such a system and that the system itself is a conservative extension of the basic system[5].

Digression: It is perhaps instructive to consider the special case, in which $Pred_1$ is interpreted as $\in$ and to see what happens to Russell's paradox in this system. The new pair of predicates is now $(\in, \bar{\in})$, $\hat{x}_1\phi(y_1, ..., y_n)$ is written as $\{x_1; \phi(x_1, y_1, ..., y_n)\}$, and $\text{Comp}_\in$ is as follows:

$\text{Comp}_\in$

$$t_1 \in \{x_1; \phi(x_1, y_1, ..., y_n)\} \leftrightarrow \phi^+(t_1, y_1, ..., y_n)$$
$$t_1 \bar{\in} \{x_1; \phi(x_1, y_1, ..., y_n)\} \leftrightarrow \phi^-(t_1, y_1, ..., y_n)$$

Now, let $r = \{x; x \notin x\}$ and assume $r \in r$. The formula $r \in r$ is atomic; hence it is positive by Definition 7 (P1), and we derive $r \in r \leftrightarrow r \notin r$ from $\text{Comp}_\in$. This is a contradiction, so $r \in r$ is false. It follows from Definition 6 (SF3) that $\neg(r \in r)$ is true in the system. A similar argument shows that $r \bar{\in} r$ is false, too. **End of digression**

Feferman [1984] shows that it is possible to develop a fair amount of set theory in his system S, of which the system scetched on the preceeding pages is only a minor variant, by considering the notion of extensional equality $\equiv$ and a predicate Cl, which is defined as follows:

$$Cl(a) = \forall x(x \in a \vee x \bar{\in} a).$$

[5]For an introduction to fixpoint techniques, see Moschovakis [1974] or chapter 6 of Moschovakis [1994]

If the resulting theory, however, contains enough natural number structure to prove the recursion theorem, then it is an intensional system in the sense that it refutes extensionality for sets (not necessarily for operations). So, if one adds the axiom of extensionality for sets in the form

Ext

$$\forall x(x \in a \leftrightarrow x \in b) \wedge Cl(a) \wedge Cl(b) \rightarrow M \equiv N.$$

to such a theory S_N, then $S_N + Ext$ becomes inconsistent according to a result of Gordeev reported in Beeson [1985, p. 235].

Theorem Gordeev: $S_N + Ext$ is inconsistent.
Proof: Scetch; for details see [Beeson, 1985]. The empty set can be defined in S. Define $g(z, f) = \{x \in \{\emptyset\}; x = f(z)\}$. The recursion theorems allow us to introduce an f such that $f(z) \cong g(z, f)$, where $\cong$ denotes equality for partial operations. That means roughly: two terms have to be equal if they are defined. Since g is total, so is f and $f(z) = \{x \in \{\emptyset\}; x = f(z)\}$. Now consider $f(f) = \{x \in \{\emptyset\}; x = f(f)\}$. If $f(f) = \emptyset$, then $\emptyset \in f(f) = \emptyset$; therefore, there is some $x \in f(f)$. But if $x \in f(f)$, then by its definition $f(f)$ equals the empty set. Therefore, $\forall x(x \notin f(f))$. Applying Ext, one derives $f(f) = \emptyset$, which is a contradiction.

2.3 Application

Let me first illustrate the present approach by analysing some classical examples from Chierchia [1988]. I shall henceforth drop superscripts and variable assignments when there is no danger of confusion. Also, I shall write *expression* for the translation of a natural language "expression" into the formal language and **expression** for its semantic value. Chierchia derives a semantic explanation for the following data:

(12) a. John runs.
b. *John to run.
c. John tries to run.
d. *John tries runs.

The translations proposed by Chierchia are as shown in (13).

(13) a. $run(John)$[6].

[6] Chierchia uses a functional not a relational notation

b. $^{\cap}run(John)$.

c. $try(John,^{\cap} run)$.

d. $try(John, run)$.

It is now easy to see why the pattern in (12) results. The expression run denotes a set of individuals and $John$ the individual John, so (12)(a) is wellformed. But $^{\cap}run$, being itself an object, cannot contain the individual John as an element. Therefore, (12)(b) is bad. A similar explanation can be given for (12)(c) and (d), assuming that try denotes a relation between individuals.

Note further that the classical examples of selfapplication like (14) pose no problem for the approach advocated here.

(14) a. Being crazy is crazy.

b. $crazy(^{\cap}crazy)$.

This is so because *crazy*, being atomic, is positive. The representation (14)(b) is therefore true if the object denoted by $^{\cap}crazy$ is an element of the set **crazy**. Also, the negation of (14)(b) *Being crazy is not crazy* behaves classically since the negation of an atomic L-formula is positive.

There is, however, a crucial methodological difference between the approach in Chierchia/Turner [1988] or Turner [1989] and the present one[7]. The following two principles proposed by Turner pose certain requirements on the domain of discourse:

(15) a. Two predicate phrases with the same denotation give rise to nominalized forms with the same denotation.

b. Two predicate phrases with distinct denotations give rise to nominalized forms with distinct denotations.

It follows from (15)(a) that nominalization is a function and from (15)(b) that this function is one-to-one. Let $\mathcal{N}\wr\Updownarrow\mathcal{P}$ be the set of denotations of nominalized forms. If one also requires, as Turner does, that the domain for one-place predicates is $\mathcal{P} = \mathcal{M} \to \{/, \infty\}$ the set of (propositional) functions from the domain of discourse into the set of truthvalues, then it follows that there is an injective function between $\mathcal{P}$ and $\mathcal{N}\wr\Updownarrow\mathcal{P}$ and further that $\mathcal{N}\wr\Updownarrow\mathcal{P} \subseteq \mathcal{M}$. There are several technical implementations of these require-

[7] I won't discuss the system in Chierchia [1988], which is based on Cocchiarella [1979]

ments. Chierchia/Turner [1988] and Turner [1989] use Peter Aczel's Frege structures [1980]. Roughly the nominalization operator in these papers is interpreted by the injective λ-functional of the Frege structures, which transforms n-place functions into objects[8].

The approach advocated here does not directly transform the denotation of a predicate into an object, but rather uses a coding device on the level of logical syntax. Therefore, in contrast to Chierchia's and Turner's theory, it is necessary for this approach to have some syntactic naming mechanism (of course not necessarily the one scetched here) available. But are there any reasons why one should prefer an approach to the semantics of nominalizations via a syntactic device? The following may be an argument in favour of the present system. Consider the example (16) from Turner [1989].

(16) a. To run is fun.
b. Everything walks if and only if it runs.
c. To walk is fun.

It is clear that (16)(c) does not follow from (16)(a) and (b). But the second premise expresses that *walk* and *run* denote the same set or the same function. Therefore, in Chierchia's and Turner's approach, the nominalization operator, being an injective function on $\mathcal{P}$, would assign the same object to the nominalized forms ${}^{\cap}run$ and ${}^{\cap}walk$. But then (16)(c) would be true on the basis of the premises (16)(a) and (b).

Now, in the present approach *run* and *walk* will be two distinct non-logical constants and therefore will be coded trivially differently. But then the conclusion (16)(c) from (16)(a) and (b) is also blocked.

In order to apply the theory to Vendler's observations, an additional predicate E is added to the language. Intuitively, $E(x)$ should be read as x is an event.

Notational convention 2: If ϕ is atomic, I shall write $\phi(e, x_1, ..., x_n)$ for $E(x) \wedge \phi(x, x_1, ..., x_n)$ and $\neg\phi(e, x_1, ..., x_n)$ for $E(x) \wedge \neg\phi(x, x_1, ..., x_n)$.

The following assumption V, which rules out a certain class of models, will be added to the system (recall that $N \subseteq M$ is the set of codes for L).

V $$[\![E]\!] \cap N = \emptyset$$

[8] For an attempt to reconstruct Vendler's observations within a version of these systems, see Hamm [1992]

Now some empirical stipulations about the denotations of perfect and imperfect nominals and their respective container allow a partial formal reconstruction of Vendler's observations.

Perfect Nominals	Imperfect Nominals	Narrow Container	Loose Container
Subsets of E	Elements of N	Subsets of E	Subsets of M

If one assumes the translation (17)(b) of examples like (6)(d) on page 78, repeated here as (17)(a), then Vendler's prediction about the behaviour of imperfect nominals as arguments of narrow containers follows.

(17) a. *John's revealing the secret occurred at midnight.
b. *occur at midnight*($^{\cap}$*John reveals the secret*).

The object denoted by $^{\cap}$*John reveals the secret* cannot be an element of the narrow container **occurred at midnight** because of assumption V. The explanation given reduces the ungrammaticality of (17)(a) to a type-mismatch. It is assumed here that there is no systematic semantic difference between *John's revealing the secret* and *John revealing the secret*; both are treated as nominalizations of *John reveals the secret*, leaving it to syntax to account for their differing behaviour. Now consider the example in (18)(a) and its logical representation and semantics in (18)(b) and (c).

(18) a. The singing of the song occurred at midnight.
b. *The e(singing of the song(e))(occur at midnight(e)).*
c. **The**({e; *singing of the song(e)*})({e; *occur at midnight(e)*}.

The is assumed to be a determiner [9].

(18)(b) is well formed since **The** is a function which is defined on sets, in (18)(b) on a set of events. If one assumes with Keenan/Stavi [1985] that *John's* in (19) denotes a determiner, the same argument applies to this example.

(19) John's revealing of the secret occurred at midnight.

Therefore, the expression *John's* plays a semantically different role in Poss-ing gerunds than in Ing-of gerunds. In Poss-ing constructions it is only a

[9] $[\![The]\!]^{\mathcal{M},g}$ = the function **The** such that for every $A, B \subseteq M$,
$$\mathbf{The}(A) = \begin{cases} [\![Every]\!]^{\mathcal{M},g}(A) & \text{if } card(A) = 1 \\ \emptyset & \text{otherwise} \end{cases}$$

morphological variant of *John* while it is a determiner in perfect nominals.

A similar argument shows why (20) is bad.

(20) a. *The singing the song.
b. *The*($\hat{x}$*sing the song*).

(20) is not even well formed on the level of logical syntax. Moreover, the interpretation of *The* is a function that is defined for sets and not for objects like the denotation of $\hat{x}$*sing the song.* The present theory also predicts that perfect nominals will be ambiguous when they occur as arguments of loose containers. The representations in (21)(b) and (c) are both possible for example (21)(a), since *fun* is a loose container.

(21) a. The singing of the song is fun.
b. *The e (singing of the song (e))(fun(e)).*
c. *fun*($^{\cap}$*The e (singing of the song(e))).*

Here, (21)(b) represents the Act-reading and (21)(c) the Fact-reading. The same strategy allow us to account for the examples (8) on page 79, repeated as (22)(a) and (c).

(22) a. The beheading of the tallest spy occurred at noon.
b. *The e(beheading of the tallest spy(e))(occurr at noon(e)).*
c. The beheading of the tallest spy surprised us.
d. *The e(beheading of the tallest spy(e))(surprise us(e)).*
e. *surprise us*($^{\cap}$*The e(beheading of the tallest spy(e))).*

Under the assumption that the tallest spy and the king are one and the same person, *The beheading of the king surprised us* is not a consequence of (22)(e) in the present account.

The examples in (23) show that narrow containers can be negated and remain narrow under negation.

(23) a. The singing of the song didn't occur at noon.
b. *John's kicking the cat didn't occur at noon.

If we assume that the negation of a narrow container is interpreted as complementation with respect to the set of events, the facts in (23) follow from the preceeding considerations.

(24) a. *The e(singing of the song(e))(*$\neg$*occur at noon(e)).*

b. $\neg$*occur at noon(*$^\cap$*John kick the cat).*

The denotation of $^\cap$*John kick the cat* can't be an element of the set which interprets the negation of *occur at noon* because of assumption V.

So far, at best half of Vendler's observations concerning the behaviour of perfect and imperfect nominals and their corresponding containers are explained by using the scetched formal apparatus. I shall discuss some of the remaining questions in the next paragraph.

3 Discussion and Problems

The mechanism so far developed is not directly applicable to the examples in (7) on page 79 because there is no semantic representation for the *non* in *non-arrival of the train.* Zucchi [1993, p 186] uses the formula $\lambda Q \lambda p(p = i(\neg\exists e Q(e)))$ to represent *non*. Here i is a function which transforms the type of propositions to the type of names but leaves the semantics unchanged. The expression *non-arrival of the train* will denote the set of propositions that equal the proposition which asserts that there is no event which is an arrival of the train. This gives the right results for the examples in (7), because *surprised us* is a loose container accepting both events and propositions and *occur at noon* is a narrow container accepting only events. Moreover, Zucchi's strategy also explains why *non-arrival of the train* can occur with a determiner. This is so because $\lambda p(p = i(\neg\exists e\, \textit{arrival of the train}(e)))$ denotes a set and is therefore a possible argument for a determiner. Zucchi's rendering of *non* is, however, not available here.[10]

I will leave these examples for another occasion.

[10]Note that the following trick won't do:

$[\![non]\!]^{\mathcal{M},g}$ = the function **non** such that for every $[\![Q]\!]^{\mathcal{M},g} \subseteq M$, $\mathbf{non}([\![Q]\!]^{\mathcal{M},g}) = \{a; a = \pi(\neg\exists x Q(x)))\}$.

This is so because $\pi(\neg\exists x Q(x)))$ denotes the code of the formula $\neg\exists x Q(x))$ and therefore the above set is always a one element set. This however collapses **The** and **Every**. To assume that $\mathbf{non}([\![Q]\!]^{\mathcal{M},g})$ denotes the set of codes of formulas equivalent to $\neg\exists x Q(x))$ does not work for similar reasons.

Another empirical shortcoming of the present approach is that there is no direct account for the different distributional properties of adjectives and adverbs in perfect versus imperfect nominals. The question however arises whether this is really a genuine semantic property of these constructions. Zucchi [1993] doubts that it is on the basis of data from Italian and Dutch. Let us presume for the moment that the distribution of adjectives and adverbs is structurally determined. Abney [1987] develops a syntactic theory which allow us to account for these facts in an elegant way. The following is only a scetch of parts of chapter III and should not be understood as an adequate exposition of Abney's ideas.

The starting point is a conservative extension of classical $\bar{X}$-theory. It is conservative in so far as it completely agrees with the classical version on the phrasal level but also allows for the attachments of morphological elements like *-ing*. The adjunction of *-ing* is, however, restricted to morphological adjunction to V as in (25) or to maximal projections as in (26) or (27)[11]. It is assumed that *-ing* has the feature [+N]. It follows from this assumption and from Abney's reformulation of $\bar{X}$-theory that the adjunction of *-ing* changes the category of a verbal projection into a nominal. In this way the structures in (25)(b), (26)(b), and (27)(b) are produced.

(25) a. John's singing of the Marseillaise.
b. $[_{DP} John's [_{\bar{D}} D [_{NP} [_{N} -ing [_{v} sing]] [_{PP} of\ the\ Marseillaise]]]]$

(26) a. John's singing the Marseillaise.
b. $[_{DP} John's [_{\bar{D}} D [_{NP} -ing [_{VP} [_{V} sing] [_{DP} the\ Marseillaise]]]]]$

(27) a. John singing the Marseillaise.
b. $[_{DP} -ing [_{IP} John [_{\bar{I}} I [_{VP} [_{V} sing] [_{DP} the\ Marseillaise]]]]]$

If one further assumes that adjectives and adverbs are modifiers of some N- and V-projection, respectively, between N (V) and NP (VP), the distribution of adjectives and adverbs in the three different gerund constructions follows. Adjectives can only occur in Ing-of gerunds because the V is converted on the lowest possible level into an N by $-ing$. Adverbials are licenced in Poss-ing and Acc-ing construction by the presence of a VP-node. Further, sentence adverbials are possible in Acc-ing gerunds because they also contain an IP-node. Now, if *not* in examples like

(28) a. *not revealing of the secret.

[11] Adjunction to CP is assumed to be excluded for independent reasons.

b. not revealing the secret.

is taken to be an adverb, the distributional behaviour of negation in perfect and imperfect nominals follows from the general syntactic account of the distribution of adjectives and adverbs in gerundive constructions.

It is not so clear how one can derive a semantic explanation for these facts. The following should not be considered as a scetch of a theory but only as a kind of "picture" of a posssible semantic account. It has often been observed that adverbs are somewhat less independent than adjectives in so far as the latter can act as predicates but the former cannot.

(29) a. The flower is beautiful.
b. *The flower is beautifully.

If this is correct, then one may assume that adverbs are dependent on the existence of certain verbal parameters. During a perfect nominalization process, these parameters become abstracted and are therefore no longer visible for the adverb. Imperfect nominals keep these parameters, as is shown by their ability to participate in modal and temporal modification. They can therefore be modified by adverbs. Assuming again that *not* in (28) is an adverb, the distributional pattern follows as in Abney's account. A lot would have to be done to make this suggestion precise, and I am not sure whether it is really worth the effort. But the "picture" goes well with Vendler's intuitive view that perfect nominals are the product of a *complete* nominalization process, while imperfect nominals are somehow incompletely nominalized.

The distribution of negation in perfect and imperfect nominals is only a special case of a more general phenomenon. The examples in (30) show that they share the property of being closed under conjunction and disjunction with imperfect nominals.

(30) a. Quisling's betraying and slandering of Norway.
b. Quisling's betraying or slandering of Norway.

From a semantic point of view, the question arises, whether the internal logic of the perfect nominals is poorer than the full logic of the imperfect nominals[12]. I am certainly not able to answer this question, but I would like

[12]It is not possible to represent the properties of perfect and imperfect nominals with respect to modal and temporal modification in the presented system, because it does not contain modal or temporal operators.

to mention some points which might be related to the general problem.

It is misleading to speak of the full logic of imperfect nominals because, as in the case of perfect nominals, there is no conditional. This is also the reason why an explanation offered by Higginbotham [1983] for the absence of conditionals in naked infinitive complements of perception verbs, even if correct, allow us to account for only half of the facts.

Naked infinitive complements share some properties of perfect nominals[13], since constructions like *Brutus stab Caesar* in (31)

(31) Mary saw *Brutus stab Caesar*.

cannot be modally or temporally modified, conditional forms don't exist, and negations are nearly always bad.

(32) a. *John watched Mary possibly win the race.
b. *John saw Mary have left.
c. *John sees Mary enter if Bill leave.
d. *John saw the ice not melt.

Higginbotham [1983, p 113] observes that subordinating conjunctions like *if*, *unless* etc. require tensed complements. So, the reason for the absence of conditionalized naked infinitive complements is the lack of a temporal parameter in these constructions. This argument could also be used to explain why conditionalized perfect nominals don't exist. This is, however, at best half of what has to be achieved, because conditionalized imperfect nominals don't exist either, but these constructions can be temporally modified. This kind of explanation is therefore not fully satisfactory. The absence of conditional forms for imperfect nominals might be taken as an indication that the negation of imperfect nominals should not be considered as negation within a logical system[14], but as a non-logical operation.

The non-existence of negated perfect nominals cannot just be attributed to the assumption that they are event-denoting expressions. It is tempting to think that the logic on the domain of events is weaker than classical logic. In the three classical areas of applications of event theory, negation seems

[13]For discussion of the syntax and semantics of these constructions see Barwise [1981], Higginbotham [1983], Muskens [1989], Parsons [1990], van der Does [1992], Mönnich [1992].

[14]At least not in the sense of Gabbay [1988], because the presence of a conditional is essential for his characterisation of negation in a logical system.

to show a non-classical behaviour. [15] Nominalization and naked infinitive complements of perception verbs were discussed above. The third main area of application, the one Davidson [1968] had in mind, is the semantics of adverbial modification. Taylor [1985] shows that the class of adverbials for which a Davidsonian analysis is viable, called *mode adverbs* by him, also rejects negation, as shown in (33)(a). Typical mode adverbs are *violently* and *bravely* in contrast to adverbs like *intentionally* or *voluntarily*, which are not in the mode class.

(33) a. *Brutus violently did not stab Caesar.
b. Brutus intentionally did not stab Caesar.
c. Brutus voluntarily did not stab Caesar.

If Vendler's intuitive explanations of the properties of perfect and imperfect nominals and their respective containers is basically correct, then, whatever the correct way to analyse these facts may be, it is not possible to simply exclude negation of event predicates. The reason for this is that narrow containers are event-denoting expressions, they can be negated, and they stay narrow under negation as the examples in (23) show.

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[15] See Parson [1990] for an overview.

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