ABSTRACT
        A comparison of the syntactic characteristics of
mathematical equations and Eskimo syntax is made, and a proposal that
Eskimo has a level of structure similar to that of equations is
described. P:t performative contrast is reanalyzed. Questions and
speculations on the formal treatment of this type of structure in
transformational grammar, and its treatment in semantic theory, are
examined. (Author/KM)

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EQUATIONAL SENTENCE STRUCTURE IN ESKIMO

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A comparison of the syntactic characteristics of mathematical equations & Eskimo syntax, & a proposal that Eskimo has a level of structure similar to that of equations. Reanalysis of p:t performative contrast. Questions & speculations on the formal treatment of this type of structure in transformational grammar, & its treatment in semantic theory.

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Up to the present, the theory of syntax has been concerned almost exclusively with what we may call nuclear sentence structures. In the functional structure of a nuclear sentence[1], the verb is the head or nucleus of the sentence. Noun phrases & prepositional phrases are arranged functionally around it as satellite phrases. Negation & many adverbials are likewise linked to the nucleus in several ways: semantically, through dependencies & in collocation selection. The linearization of such nuclear structures gives rise to the 2 fundamental types of deep structure, Vb+NP+NP+NP & NP+NP+NP+Vb as in Arabic & Japanese respectively[1] from which other structures such as Subject-Predicate, e.g. NPVb+NP or Sj+Vb+Oj, appear to be derived.[2]

While some Eskimo sentences allow analysis into subject & predicate parts, & other sentences appear nuclear in structure, neither pattern suffices but for a fraction of sentences. Indeed, the largest portion of running text cannot be readily analysed as either of these types of structure. And because the primary constituents of these problematic sentences, taken

individually or in pairs, can function as independent sentences & can then be analysed in nuclear or subject-predicate terms, one must conclude that the traditional structures exemplified by these constituents are special or trivial cases of a here-to-fore undescribed structure.

On the most intuitive level, these problems in analysis arise because one cannot reliably identify the nuclear verb or predicate of even a simple sentence like:

una pisuktuq iglaktuq.

    una   ≡ that, that one
pisuktuq ≡ he walks, the one who walks (OR is walking)
iglaktuq ≡ he laughs, the one who laughs (OR is laughing)

Such a sentence may be translated equally well as "that one walks & laughs", "that one which is walking laughs", "that walker laughs", or even with the right intonation, "that one which laughs/is laughing walks/is walking". This problem becomes more serious if more words are added. At 1st glance, it seems to be a purely semantic problem, but it has important syntactic implications as I will try to show.

Here I want to explore this other type of functional structure[3], which I call equational because of its similarity to the structure of complex equations in algebra. To my knowledge[4], equational sentences are not well represented in English or any other language on the Eurasian continent. In fact, the only language I know of which makes systematic use of this equational organization is Eskimo. This organization of expression does not affect what can be expressed, only how it is expressed. Moreover, this organization is exhibited only at the highest

level of syntactic constituents. The constituents which are equationally related are themselves organized in a nuclear structure resembling that of sentences in English or other languages. These facts have given rise to seemingly contradictory statements like, "Each word in Eskimo is a sentence", & "Each word is a nominal"[5] & even (attributable to me) "The notion of sentence does not make sense for Eskimo". I have come to believe that each of these statements expresses some truth, but as seen from different viewpoints. The whole truth, it seems to me, is alien enough to the usual conception of syntax that I can not hope to convince any one who has not aready studied Eskimo, or other equational language, if such exists. Accordingly this paper has limited goals:

1. to show that this equational type of analysis is possible, & meets the facts in Eskimo at least as well as any nuclear type of analysis;

2. to implant these ideas in the minds of both Eskimos & linguisticians, to flower at some later date if they are true; &

3. to provide an alternate model for the beginning student of Eskimo to integrate his experience. If, as I believe, this model is right, the younger jeneration will be attracted to it in increasing numbers.

A theory of equational structures cannot be proposed at this time because it would be ill-motivated indeed, if it were based on a single language. There is however, a need for such a theory & its integration into a general theory of syntax & semantics, which I will speculate a bit on later. Prerequisite for that

endeavor, however, is the identification of other languages of this or similar natures. I would hope then that the equational structures motivated here for Eskimo will be recognized as a minor type of functional sentence organization, & similar languages, if there are any, will be analysed in comparable terms.

First, we shall build up some principles for the identification of equational structures, using the complex equational notation of elementary algebra as a model (1). Then (2) we shall turn to Eskimo to see that its several types of sentences do exhibit the characteristics of equational structures. Then after (3) reanalysing 1 of the problematic syntactic contrasts of Eskimo, we will return (4) to some equational structures in languages closer to home. Finally (5), I shall draw together the major observations & speculate on their relevance to modern syntactic theory.

1. Equational Sentences. The organization & properties of equational sentences are well illustrated in the notations which have evolved in arithmetic, algebra & calculus. There, a simple equation is the usual form for stating a proposition.

$$4x' \quad 6 + x$$

Such an equation can be asserted, denied, doubted, or questioned, although the standard notation does not include such performatives[6]. These performative notions are expressed in natural language accompanying the equation. Because '=' is symmetric, there is an other equation, $6+x = 4xy$, which is identical in meaning to the above. Following common usage, I

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will consider them to be "the same equation".

Not infrequently several equations are combined to make a "complex equation" which equates 3 or more terms.

$$3xy = 5y + x/r = r(x + y)$$

or

$$A = B = C$$

Such a complex equation can be decomposed into 3 underlying equations;

$$A = B$$
$$B = C$$
$$C = A$$

Only 2 of these underlying equations are independent; 1 of them aids nothing which was not in the others. It does not matter which 2 are considered to be the basic ones, the 3rd can always be derived from the other 2. If there are 4 terms equated, there are 6 underlying equations of which any 3 are independent, providing that all the terms occur in at least 1 of the 3 equations.

A complex equation of 4 terms,

$$A = B = C = D$$

is decomposed into 6 underlying equations,

$A = B$	$A = C$
$A = D$	$B = C$
$C = D$	$B = D$

With 5 terms there are 10 underlying equations. If 10 terms are equated, there are 45 underlying equations, & so on. In general,

a complex equation of N terms can be decomposed into N(N-1)/2 underlying equations. Complex equations provide a compact & efficient notation if a number of things are equated.

Decomposition into underlying equations is commonly used in mathematics to specify the meaning of a complex equation. Once the meaning of each simple equation is specified, the meaning of a complex equation is defined as the conjunction of its underlying simple equations. As we noted however, not all of the underlying equations are independent; some add nothing to the meaning of the others. So long as we do not consider different performatives, it is semantically irrelevant which of the underlying equations are chosen to be the base structures. It is somewhat unsettling for the theory of transformational grammar, however, to find propositions like these complex equations. They are derived from the conjunction of a number of structures, but it does not matter which of a set of structures are included in that conjunction, providing that a certain minimum number of independent ones are included. If syntactic theory requires identical deep structures for synonymous sentences like the above & its reflection D = C = B = A, then their deep structure must be this set of underlying equations. Consequently both complex equations must be syntactically ambiguous in a number of ways without any accompanying semantic ambiguity. Such annoying facts may be rejected from theoretical consideration on the basis that they concern an artificial mathematical notation, & are not facts about a natural human language. If however I can show that Eskimo has structures of this nature, these problems must be considered.

When a complex equation is denied (or questioned), it is possible that every equation in its decomposition is denied (or questioned). Invariably in usage, however, not every underlying proposition is denied (or questioned), but only some of them. It is of course impossible to deny only 1 of the underlying equations, as that will lead to contradiction. In the example above, to deny $A = B$ while leaving $B = C$ & $C = A$ is contradictory as $A = B$ can be derived from the latter 2. Two of the underlying equations must be denied together. In denying larger complex equations, 3 or more underlying equations must be denied together, the matter of which ones being rather important if contradictions are to be avoided.

In complex equational structures, propositional attitudes (doubt, assertion, imperative, interrogative, &c) logically apply to the _terms_ of the equation, & not to the equal marks, nor to the underlying equations. If there are 7 terms equated, then there are 21 underlying propositions. If 1 of these terms is doubted, 6 terms remain equated without doubt applying to them. The equation of these 6 terms derives from 15 underlying equations which are not affected by doubt. That leaves 6 of the underlying equations which the doubt affected. It is clear why this is so. The minimal denial in a complex equation is to pull 1 term out of the group of terms which are equated. Since that term would otherwise be equated (in a group of 7) to 6 other terms, 6 underlying equations are denied. Denial or questioning of part of a complex equation is really a denial or questioning of a term, i.e. of its inclusion in a group of equated terms.

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The same logic & comments apply to negation. Thus in complex equational structures, performatives & negation are associated semantically with the terms & not with the "=".

Based on these observations, it seems rather artificial to decompose a complex equation into simple equations.   The underlying equations are numerous, & they flick into & out of existence in flocks when some term is negated, asserted, questioned, &c. If these complex equations are not derived from conjunctions of underlying simple equations, then the problems with syntactic ambiguity disappear, negation no longer applies to flocks of underlying equations, & negation (& performatives) may be expanded optionally in each term. But this decomposition is necessary if "=" is treated as a verb or predicating element of which there is only 1 in a sentence. Suspicions are aroused about treating equality as a verb, however, by Frege's semantic treatment of copular identification[7], & by recent demonstrations that copular verbs do not exist in deep structure[8].

Because the _equals_ sign does not contrast with any symbol in a complex equation, it carries no semantic content.   No other relation can replace an '=' without splitting a complex equation into 2 smaller equations. Moreover, except in a 2-term equation, it does not even contrast with its negation; negation, like the performatives, is associated with the terms. Thus, '=' can carry no information about descriptive semantic content, i.e. the meaning in the narrow sense. In a limited sense, however, '=' does contrast with other symbols. To equate a group of terms in the syntax of this notation, each term must be separated from the other terms by "=". If some other symbol occurs, then the term

is not finished. Thus '=' carries syntactic information; it
marks the boundaries of the terms.

Summing up the traits that characterize equational sentence
structures, we have found the following. (1) An equational
sentence has no syntactic end; it can be continued indefinitely.
(2) There is no syntactic structure between the terms except
perhaps for a single node dominating them. (3) The order of the
terms is not significant. Any arrangement of the equated terms
is equivalent[9]. (4) Negation applies to terms; each term may or
may not be negated. (5) Performatives like question, assertion,
&c likewise apply to terms. (6) The boundaries of terms must be
detectable, & may be marked by an object like "=". Because it
has these properties, an equational structure is formally
equivalent to an unordered list of terms, where negation &
performatives are optionally applied to each term.

   2. Equational structures in Eskimo. An Eskimo sentence like

        <man walk+s   black+s   laugh°s>[10]
        inuk pisuktuq qirniqtuq iglaqpuq.[11]
        'The walking black man is laughing.'

appears to be equational in nature. It has no syntactic end; it
can be continued indefinitely by adding more words. Any
arrangement of these words makes a paraphrastic sentence, & any
combination of them is also a sentence. Hence there is no
structure between these words. Moreover, each of the words has
the same distribution in the syntactic possibilities of the
language, except for small variations. They are all noun-like, &
<man> inuk is an unanalysable noun. Because all of these words
except for <man> can be uttered in isolation as a complete

sentence, let us call them "clause words". The 2nd <walk+s>, for example, can be translated either as a sentence "he walks", or as a nominal whose descriptive content is all in a relative clause, "he who walks". These clause words can embed negation <-Neg-> -ggit-, as in <walkNeg+s> pisuppittuq "he (who) doesn't walk", & any of the performatives, e.g. binary question -aa <-s?> in <walk°s?> pisukpaa "does he walk?" Moreover, any arrangement of the words is possible, the arrangements differing in what is the theme (topic) & what is the focus.

    <man walk+s laugh°s black+s.>
    inuk pisuktuq iglaqpuq qirniqtuq.
    'The BLACK walking man is laughing.'

This matches quite closely what we expect for an equational sentence structure. There are indefinitely long sentences (1) with no structure between the constituents (2). Rearrangement makes no difference in descriptive content (3). Each word is syntactically the same sort of object, a 'term' in the mathematical jargon. Lastly, negation (4) & performatives (5) apply to terms. The syntactic characteristics of equations & Eskimo sentences match perfectly, except that the "=" is not expressed in Eskimo: the term boundaries are phonological word boundaries (6), marked by the lack of assimilation & the possibility of pausing.

While this simple type of sentence is not exceptional, it is uncommon for a sentence to be composed of only this type of term. Quite common is an other type of structure, which appears to have a nuclear organization. These are traditionally called 'intransitive' constructions. To say "the man walked (around) in Iqalluit (the town of Frobisher)", one can say,

    <man walk+s Iqalluit-at.>
    inuk pisuktuq iqaluŋni.

The equational structure can still be found between <man> & the rest. Although any arrangement is still possible, to place <man> between <walk+s> & <Iqalluit-at> is definitely emphatic. The obvious conclusion is that <walk+s> & <Iqalluit-at> together form a constituent. This constituent is functionally equivalent to a term in an equational structure because it can be placed anywhere into the 1st type of sentence, & because other terms can be added to this type of sentence.

This type of behaviour is exhibited by other 'adverbs' of direction, manner or route. They are dependent on a clause word, which they modify semantically.

    iqaluŋni   in/at Iqalluit
    iqaluŋnit   from Iqalluit
    iqaluŋnut   to Iqalluit
    iqaluktigut   via Iqalluit
    iqaluktitut   like Iqalluit

Even an indefinite direct object is expressed in this 'intransitive' structure, with a postposition -nik <³ly> (³ for plurals).

    <bear man³ly see⁰s.>
    nanuq inuŋnik takujuq.   'the bear sees some men.'

What is for us a verbal notion with satellite phrases (noun & prepositional phrases) around it is expressed in Eskimo as a single term which has a nuclear structure. Except for some grammatical objects incorporated into the clause word, the satellite phrases are separate words which we can call 'adjuncts'. Every adjunct is syntactically optional & is marked by a postposition indicating its relationship to the verbal

notion. This nuclear verbal notion is expressed as an ordinary
clause word, & marked with <-s> or 1 of the other endings[12] for
clause words. Together with whatever adjuncts it has, the clause
word forms a term like the ones above. It can stand alone, or it
can be combined with as many other terms as is desired, always
forming a complete sentence. Like a single clause word, the
complex term composed of clause word plus adjuncts may be
translated either as a complete & independent sentence, or as a
relative clause.

At this point, I would like to underline the distinction
between 'word' & 'term'. A term is any word or group of words
which can function as a single term in a sentence such as the one
we began with. We have identified 3 types of phonological words;
an unanalysable noun, a clause word & an adjunct. A noun or a
clause word is a term by itself, but both may combine with
dependent adjuncts to form complex terms. The adjuncts we have
seen must combine with a clause word to form a term, & a n
plus <-Pos> combines with an possessive adjunct marked by <-'s>
to form a complex term (see below). Thus every term boundary is
a word boundary, but the boundary between an adjunct & its clause
word is not a term boundary. However, as every adjunct is marked
by a postposition & every clause word has a special ending, the
term boundaries are easily identified as word boundaries across
which there are no syntactic dependencies. The term is a
constituent except that its unity can be destroyed by moving an
adjunct away from the unit. The word is a lower level
constituent which is composed of morphs arranged according to
strict syntactic rules, but which cannot be split up or

rearranged.

There is a 3rd type of term to be discussed, the so-called
'transitive verb' & its adjuncts. Again it can be analysed as a
term of an equational structure. An utterance like

        <man bear's see+ThgPos.>
        inuk nanuup takujaa.
        'The man is seen by the polar[13] bear.'

can be analysed as an equation between <man> & the rest. The
word <bear's> is the "relative" or "possessive" case[14] of <bear>,
& the <see+ThgPos> can be analysed into <see+Thg> takujaq "thing
which is seen" marked for possesssion <-Pos> (-a) by a singular
object.   The   relative   case   <-'s>   (-up) is used to mark
possessors, & the 2 together <bear's see+ThgPos> may be
interpreted as "a bear's seen-thing", i.e. "thing which the bear
sees". Constituents such as this can enter into equational
structures, so they must be terms as well.

        <bear's see+ThgPos walk+s laugh°s.>
         nanuup takujaa   pisuktuq iglaqpuq.
        'The walking one which the bear sees is laughing.'

The apparently nuclear structure <man bear's see+ThgPos> is no
more than a simple equational sentence with 2 terms.

There is 1 last type of support for the equational analysis of
Eskimo. Nominal terms like <that> & <bear> can be put together
to make a 'nominal' sentence like the following. However, either
term by itself does not form a sentence, & can be uttered only
with a supporting context, for example, if preceded by a
question.

        <that bear.>
         una   nanuq.   'That's a (polar) bear.'

        *<that.>
         *una.

        *<bear.>
         *nanuq.

This is exactly what is expected if a sentence is a series of terms equated. The 1st sentence is unavoidable in this analysis because nouns are terms. But the 2nd & 3rd sentences are impossible because an equation must have at least 2 terms.

Many languages, e.g. Russian, have a copular sentence structure which looks superficially similar to these equational structures;

    Russian
      <I person.>
       ja Celovek.   'I am a person.'

      <person good.>
       Celovek xoroSo.   'The person is good.'

I do not believe that these can be considered examples of equational sentences, except perhaps on a very superficial level. For them, there is no possibility of continuing as there is in Eskimo;

      Russian
       *<I person good.>
       *ja Celovek xoroSo.
      Eskimo
        <that person good+s.>   That person is good.
         una   inuk piujuq.   /That is a good person.

Further, rearrangement of these constituents is strongly limited, *Celovek etot, & negation is nuclear & applies to the whole

sentence, "etot net čelovek" rather than being associated with a particular term.

In equational structures, performatives & negation apply to terms. A sentence of purely nominal terms is clearly equational, but there is no obvious way to negate these terms. However, there is a way to make a clause word out of a noun: to add -u- <Be> 'to be' & an ending like <°s>. Thus the following are effectively synonymous.

```
<that bear.>          ⌐
 una   nanuq.         |
                      ⊢ 'That is a bear.'
<that bearBe°s.>      |
 una   nanuuvuq.      ⌐
```

The latter, however, can be negated as it contains a clause word.

```
<that bearBeNeg⁺s.>
 una  nanuuŋŋittuq.    'That is not a bear.'
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Similarly it can be questioned, or put under the action of any performative. In this way, the nominal terms are also susceptible to negation & performatives.

Perhaps the strongest demonstration of the equational nature of Eskimo is the possibility of negating the various terms individually. All of the possibilities in the following schema can occur.

```
┌ inuk      ┐┌ pisuktuq ┐ nanuup ┌ takujaa  ┐.
|inuggittuq||pisuggittuq|        |takuggittaa|
└1        1┘└2         2┘        └3         3┘
```

Thus negation applies to terms, as can doubt or question, except that it is not easy to find a context for such questioning. Rearrangement of these terms is generally possible, except that a pure noun not at the beginning is likely to have a -uvuq <Be°s> attached.

The 4 types of structure discussed exhaust the possibilities cf translation of independent & relative clauses of a western language. From the sorts of evidence noted, I conclude that Eskimo sentences are organized on an equational structure[15]. A sentence is a series of terms which are understood to be descriptive of the same cbject in the universe of interpretation. One type of term is a simple noun or demonstrative, the other type is a clause-word optionally accompanied by dependent adjuncts. These clause words can be negative, interrogative, assertive &c, as are the terms in an ideal equational structure.

3. The pit distinction. I have avoided an important problem up to now, the contrast between 2 classes of clause-word suffixes; p-forms like <°s> -pug & t-forms like <+s> -tug, & their allo-forms after vowels, -vug & -jug respectively. The usage of p-forms & t-forms has been investigated under the guidance of J-P. Paillet by M. Devine, M. Uviluq, & J-M.

Massenet.   Their tentative conclusion (unpublished) is that once
a p-form is used of some fact in the description of a particular
situation, a p-form cannot be further used for that fact in that
situation, either by the person who used it before, or by someone
else.   While this is an accurate description, it is not complete
& it could be at best observationally adequate: it needs an
explanation.   It was speculated in the above investigation that
using the p-form is somehow like claiming to be the discoverer of
the fact.   Once a fact has been discovered, no one else can claim
it.   Alternatively, it might be that the p-form marks the
entrance of a new fact into the discussion. I would argue for an
other interpretation; the p-form marks a predication, while the
t-form marks an attributively used term. An other speaker can
not predicate what someone else has recently predicated, just as
in   English.   This   explanation receives support from the
interpretation of sentences such as the 1st several examples in
the section above.   There the p-form is translated as the
predicate of the sentence, regardless of where it is located in
the sentence.   The t-forms are translated as attributive
adjectives or relative clauses.

A perceptive native speaker, Abe Okpik,[16] has offered 2
different explanations of the p:t contrast. One is that t-forms
are used for observed facts & p-forms for reported facts. This
observation matches tolerably well with our hypothesis, as only
observed or known facts can be used attributively. Reported
facts, on the other hand, are those which are predicated or
asserted.   His other observation is that t-forms are for visible
facts, while p-forms are for invisible facts.   A   literal

interpretation of this is not possible, so I take 'visible' to mean "known to the participants of the conversation", the facts one uses attributively, & 'invisible' to mean "not already known", i.e. those facts that are predicated. Thus both of these generalizations support the analysis of the p:t distinction as a contrast between predication & attribution.

Synatctic support for this hypothesis is found in embedded clauses, which are invariably terms in t-forms. The p-forms are not possible in embedded position. For example, "he sees someone walking",

```
<walk+mik see+s.>      pisuktumik takujuq.
*<walk°mik see+s.>     *pisukpumik takujuq.
```

The interpretation this hypothesis gives to this fact is that predications are not allowed in embedded clauses. Such a principle seems reasonable enough in the light of similar restrictions in other languages.

Moreover, p-forms are obligatory in questions. This fact also follows from our explanation. Because interrogation cannot be made about attributions used for reference, they are by nature restricted to predicative forms. THIS IS A LOGICAL NECESSITY FOR ANY LANGUAGE.

If the difference between the p- & t-forms is a difference between predication & attribution, it can explain the tendency in Quêbec dialects to avoid the p-forms, which are felt to be "vulgar" or "low class". Predication & assertion are not dissimilar. But to use an assertion is not very different from being assertive, a characteristic which is disapproved of by most

Eskimo culture. If the p-forms are understood in Québec to express assertions, it is to be expected that their use would be avoided.

I hypothesize then that p-forms are predications or assertions, while t-forms are attributions (attributive forms used in further specifying a referent). However, a t-form can also be used predicatively, not only in Québec, but also west of Hudson's Bay. The motivating factor for this may be what I have proposed above. Nevertheless it is not immediately apparent how an attributive t-form can be used at all for predication. In other languages, however, a substantive (noun or adjective) may be used predicatively without other mark, although the resulting expression may not be grammatically acceptable. In English there is for example the following use of attributive forms, big chief & smart, as predicates.

    me, big chief.
    man coming, smart.

This "elementary" use of English is usually restricted to conversations with children or foreigners, i.e. with people we do not expect to be able to use the language well. Nevertheless it does demonstrate that there is a limited sub-code of English which uses attributive forms for predication.

In fact, the use of non-predicative forms for statements is not at all strange. Paillet discovered a class of examples in English where a similar type of usage is found. In the captions of pictures where the depicted object is known, non-predicating gerundive forms are common.

PICTURE -I-

Driving across the border with a load of hash

PICTURE -II-

Explaining to the officials

A grammatical subject may be added to identify the depicted object, & in some cases, a 2nd comment can be added.

PICTURE -III-

André showing them how to smoke it

PICTURE -IV-

All of us together enjoying the hash,
the spirit of revolutionary solidarity

Here there is a group of equated things: the picture, the description or comment(s), & optionally the "subject". Eskimo is similar to this type of English usage, so much so that Eskimo might conceivably be called a "picture caption language". I conclude from these usages of English & Eskimo that the use of non-predicative forms for predications is not unusual in language. It is thus a plausible hypothesis that the t-form is attributive, while the p-form indicates predication.

This hypothesis explains why in our 1st sentence the p-form was always translated as the predicate. That observation might seem to provide an easy way out of admitting equational structures in Eskimo, to take independent t-terms as relative clauses on the subject. However, this tack will not solve the problem, as several p-terms may occur in the same sentence, leaving us back where we started from.

```
<person walkºs laughºs bearʲly seeºs>
 inuk pisukpuq iglakpuq nanuqnik takuvuq.
'The person walks & laughs & sees some bears.'
```

4. **Equational structures in English**. Because it is not enough, I believe, for a science of language to discover & attribute strange things to languages well removed from the direct experience of most researchers, I will indulge here in bringing these observations about Eskimo home to English speakers. I hope thereby that they will be able to "feel" to some degree a syntactic device which finds considerable use in Eskimo. At the same time, the theoretical problems raised by Eskimo are mapped into problems about a language which has been studied far more extensively.

English syntax is based on the nuclear structure where satellite phrases are arranged around, dependent on, & interpreted with respect to the nuclear verb. Notwithstanding, there are a few places where the equational type of sentence appears even in ordinary prose structures. I assume that both patterns are available to all languages, though 1 pattern may be much more frequent in 1 language than the other.

One crack in the general nuclear façade of English is the expression, "a rose is a rose is a rose". One is tempted to account for such as an emphatic form of "a rose is a rose", but similar emphatic forms do not occur for "a dog is an animal"; there is no *"a dog is an animal is an animal" or *"a dog is a dog is an animal". Nor is it an idiom restricted to the word rose; "a dog is a dog is a dog" is just as satisfactory. There appears to be no half-reasonable way to generate such sentences, without accepting that we have some competence in equational sentences which is restricted to equating obviously equal things.

An other sentence type which does not find a place in nuclear or subject-predicate models is the "parallel comparative";

the bigger he is, the harder he falls.

the bigger he is, the harder he falls, & the more he gets bruised.

There is an optional marker then to separate them. This suggests an if...then... source[17], but I cannot find such a source. There seems to be no reason to take the then as anything other than an explicit term-delimiter & a marker of the place in an equational structure after which are found the predicated elements. The intonation of these sentences is exactly that of a series of 2 or 3 nominals like:

the type it is & the strength of its surface

they type they are, the colour they are, & the shape they might have

However, the parallel comparatives cannot be conjunctions like these latter. The elements which are conjoined to make a compound sentence must themselves be sentences, but "the bigger he is" & "the harder he falls" are not sentences.

These examples cannot be explained in English grammar. At best, they can be handled as idioms which contain general NP slots, sort of "sentence-patterns" as it were. The alternative is to accept that equational structures are possible, but extremely restricted in English.

These equational sentences are anomalous by every nuclear model of syntax, from Tesnière to Fillmore, & they do not fare much better in the subject-predicate models (see note [1]).

Accordingly, these structures tend to be either ignored, or to be relegated to a secondary status. Because linguistic models of syntax have all been nuclear or subject-predicate, & because every linguistician tends to think in these terms, these examples can hardly be convincing. They are anomalous facts which are known of, but not worried about. I present them here to remind the nuclear-minded linguistician that the nuclear model cannot account naturally for systematic parts of even his own language. To be sure, he can stretch his model to account for them, but that stretching is needed only to counteract the assumption built into his model, that nuclear sentences exhaust the possibilities of sentence types.

For those who grew up with mathematics in their blood & got used to equational structures early in life, these examples demonstrate that one does not need to go to the North Pole to find equational sentences. For those who assume that there is a human competence for language, they must accept that we have this competence for equational sentences if Eskimos have it. Clearly, if we have this competence & our language does not encourage its use, it is fair to expect it to appear in the cracks & corners of our language. If such did not appear, I think it could be considered as evidence against an hypothesis of a competence for equational sentences. Since it does appear, we can only say that we should expect it with the present hypothesis. But since it is contrary to the general patterns of English, & cannot be explicated in those terms, I take it to be supporting evidence.

Although structures such as

John is our butcher.

may have an equational semantic effect, I would argue that it
does not have an equational functional structure. Of the 6
characteristics isolated for equational structures, only the 3rd
(that order is not significant) is clearly met. Others are not
met: neither negation nor performatives are associated with the
terms, & it can not be indefinitely continued.

    *he is John is our butcher is nice is a guy.
    OK: he is John, our butcher, & is a nice guy.

Thus unlike Eskimo structures, copular sentences of English do
not exhibit a functional structure similar to that of equations.

5. Summary. We have observed the characteristics of complex
equations & of the major type of constituent in Eskimo, & found
them to be identical. We conclude that Eskimo is an "equational
language" when analysed into these constituents (called 'terms'),
a language wherein the equational structure plays a major role.
If half of the arguments I have presented about Eskimo stand,
then syntactic theory as it presently stands is seriously
inadequate, & needs revision to account for equational languages.

The sentence constituents or 'terms' in Eskimo comprise 1 or
more phonological words. Terms may be either nouns plus optional
possessors, or clause words plus optional adjuncts. Every term
of the latter type has exactly 1 clause word which has an
inflection for person & number. To the clause word may be joined
any number of adjuncts marked by postpositions which show their
functional relations to the nuclear clause word. Thus the
functional structure of a term is nuclear. Analysis of the

clause words shows them to allow VP embedding, while adjuncts may embed terms.

The existence of 1 natural language with an equational nature poses a problem to linguistic theory: how can equational structures be described within a generative framework such as transformational grammar? All well-known transformational grammars have had a categorial component which expanded the axiom S either in a nuclear fashion S --> Vb+NP+(NP)+(NP), or as a subject followed by a predicate, S --> NP+VP. Both types of expansion are totally inappropriate to complex equations, & by extension to equational structures in Eskimo. The only plausible explanation is to derive equational structures from a conjunction schema, S --> (and S)*, where each S is a term & * indicates the coordination of any number of the parenthesized constituent. For mathematical equations, this would be S --> (= S)*, & for Eskimo it is S --> S*.

This explanation naturally accounts for indefinitely long sentence structures in terms of a well-established expansion rule schema. It also accounts for the lack of structure above the terms & for their possibilities of rearrangement. Moreover it accounts for negation & performatives applying to terms, as the terms are sentential objects by this explanation.

This explanation poses serious questions about conjunction & about what S stands for. Either it is possible for the conjunction of 1 type of constituent to form a different type of constituent, or else S & S are constituents of the same type. Taking the latter alternative, i.e. not modifying our

understanding of conjunction, we will have problems in blocking syntactically sentences that consist of only a single noun, like *<this>.

It also requires that attributive modifiers be treated as sentences which have been conjoined[19] with the subject & the predicated property. As we usually understand sentence conjunction, it is a conjunction of assertions with assertions, or questions with questions, or the like. Here however, we shall have to allow not only conjunction of assertions, questions, &c, but attributions as well. This explanation also requires treating words that are obviously nouns (e.g. _inuk_ 'man') as constituents of this same type: sentence-like. However, if we adopt a generative semantic standpoint, these requirements are not undesired. Nouns, adjectives & verbs have been argued independently[20] to be all of the same nature, predicators. Thus, because the structure of Eskimo is inconsistent with the general notions of sentence-structure in which transformational grammar developed, Eskimo may turn out to be invaluable for further development of generative semantics, if it indeed expresses much more directly some aspects of the deep structures proposed in that theory.

Although the point of this paper is simply that there is this other type of structure, & that linguisticians must deal with it, some deeper explanation may be proposed. The difference between nuclear & equational sentence structures may be explicated in terms of an adequate semantic representation, such as C-net theory.[21] In semantic representation, there must be non-verbal elements (points, indices or variables) which can refer, all

lexical items must be represented as predicates which take referential elements or other predicates as arguments, & conjunction must be the unmarked relation between 2 predicates. In such a representation, nuclear sentence structure is an expression of some semantic network by means of choosing some particular predicate as the nucleus. The elements it predicates upon are expressed as its subject, object, indirect object, &c. Where the element predicated on is a referential element, a description composed of other predicates dominating it is given. Thus a nuclear structure expresses a portion of a semantic network by assigning some predicate a central or nuclear role, & attributing descriptive lexical elements to its actants.

The equational structure, as seen from this semantic viewpoint, is the "dual" of the nuclear structure. Instead of organizing expression around a particular predicate (the nucleus) & its actants, expression is organized around a particular referential element. A "sentence" is then a series of descriptions about a single individual. In algebraic equations, the referential element is a single number (constant or variable), of which there are several (at least 2) descriptions (our 'terms'). In Eskimo, this element may be a person, thing or whatever. Each term expresses a predicate which describes it, & may relate it with other referential elements. If follows naturally that these sentences include indefinitely many terms. And since conjunction is the unmarked semantic relation between predicates, this equational structure may be analysed as a conjunction. And because negation & performatives apply to predicates, they must occur with terms. In short, the

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characteristics of equational sentence structures follow from a principle which organizes expression around a referential element, instead of around a predicate.

- - - N O T E S - - -

1 Most recent models of language structure have been nuclear.
See for example Tesnière, Pike, & more recently, Fillmore. An
other type of structure, subject-predicate or topic-comment,
derives from Aristotle & has often been proposed as the basis of
sentence organization (e.g. Chomsky before 1968). However, it is
not a _functional_ organization because it does not express the
functional roles of the various nominal satellites in a sentence.

A more complete explanation of these notions is contained in
my 'Nuclear model of sentence organization' (1973, unpublished).
That also contains the derivation of a number of syntactic facts
from these basic assumptions.

2 McCawley "English as a VSO [Vb+Sj+Oj] language" (1970) _Language_
46: 286-99.

3 Discussions with J-P. Paillet have been invaluable in
formulating a number of the observations made here. The
translations into definite & indefinite articles derives from his
paper "Elementary sentence structures in Eskimo" (1972) to
Canadian Linguistic Assn (Newfoundland). Other contributions of
his are noted in discussion.

4 Excluding (for lack of knowledge) languages of the Finno-Ugric,
Uralic & Dravidian groups. See A. Sauvageot 'Charactère
oularoïde du eskimo' (1953) BSocLing 49: 107-24.

5 See A. Schmitt 'Der nominale Charakter des sogenannten Verbums
der Eskimo-Sprache' (1955) _Zeitschrifte für Vergleichende
Sprachforschung_ 73: 27-45.

6 A question mark can be placed above the "=" for questioned
equations, & a slash is often superimposed on the "=" for denied
equations, but these are not standard & they do not contrast with
a mark for assertion &c.

7 G. Frege, 'Über Sinn & Bedeutung' (1892) _Zeitschrift für
Philosophie & für Philosophische Kritik_ 100.

8 E. Bach, '_Have_ & _be_ in English Syntax' (1967) _Language_ 43: 462-
85.

9 In natural language, we might expect that terms might be
arranged in order of their information content, their
specificity, their interest, or most likely, topic 1st & focus
last.

10 The angle brackets < > enclose a "pidgin translation" or
morpheme-by-morpheme equivalent. The use of pidgin is intended
to make the argumentation meaningful to the non-eskimologist
without committing Eskimo forms to memory & learning the details
of Eskimo morphophonemics. Moreover, the details of forms &
morphophonemics differ from dialect to dialect, & people who know

other dialects tend to be distracted by these differences. Lastly, as I intend my remarks to apply to all the dialects, regardless of their phonological details, the quoted phonologic forms are intended only to aid those who know this or a similar dialect. For the definition & motivations of a pidgin translation, see Hofmann & Harris 'Pidgin translation' in <u>Meta</u> 15: 11-26 (1970).

Because there is a 1-to-1 correspondance between the formatives of the language & its pidgin, the argument is more easily followed in the pidgin unless one already knows Eskimo. However, this same correspondance requires that the p-forms & t-forms be kept distinct since we shall look at them more closely below. I have used + to indicate a t-form & ° to indicate a p-form.

[11] The examples used here are from Eastern Eskimo, including the dialects of the Keewatin, Baffin Island & Québec. There are 3 distinctive vowels, i, u, & a, with lax I.P.A. values except when next to a uvular consonant. There they are lowered & backed (as possible), & pick up some r-colour. The consonants are as follows.

		M A N N E R		
	nasal	(-)	-	♦
	voicing	-	+	(+)
P	labial	p	v	m
O				
S	apical	t	j	n
I				
T	dorsal	k	g	ŋ
I				
O	uvular	q	r	
N				
	special	s	l	

( ) indicates redundancy

The voiceless consonants are usually stops, but single q is fricative in Québec, & single s is always fricative (pronounced [h] to the west of Keewatin). Doubled, s & q are either affricates or (long) stops, depending on the dialect.

The voiced non-nasal consonants are usually fricative, but are affricates when doubled. However, single j is a glide & single l is a liquid.

A word is a sequence of syllables, each of which begins optionally with 1 of the consonants above followed by a vowel, & is optionally closed by a consonant in which manner distinctions are neutralized. The special s or l cannot close a syllable, but any other cluster of 2 consonants is possible. However, manner features assimilate regressively in a cluster unless there is a boundary, & there is a strong tendency for them to assimilate in position as well (stronger to the east). The "special" position is not a phonetic position other than apical. It is a <u>position</u>

only on the phonological level, where several phonological
processes & the phonetic mapping require it to be a position.

This is an extremely concise statement of a system of
phonological contrasts, yet it appears to be accurate & complete,
excluding minor dialectal phonetic variations. In essence, this
description defines segmental contrasts & gives their significant
(& some major non-significant) phonetic realizations. In
addition, it rules out all impossible phonotactic combinations &
many morphonemic possiblities which do not occur. Moreover, this
description appears to be adequate for every dialect between
northern Greenland & the MacKenzie River.

[12] <-s> -ug designates a singular referent. There are other
endings for referents composed of 2 objects & for referents of
more than 2 objects. Where the referent is the speaker or the
addressee, there are special endings to designate that. All this
is obvious & unqestioned by eskimologists, though there are
serious questions as to the system of realizations for these
endings, & there is considerable dialectal variation in the rarer
combinations (e.g. Question + 1st person dual). Because I will
use only obvious endings, & because one can get entangled in
morphological detail which is irrelevant to the present purpose,
I will not provide support for these endings. Indeed, that would
bore the eskimologist, & be confusing or unnecessary for anyone
else. If the reader desires to be convinced of this point, he
should consult any good elementary grammar of Eskimo, such as L.
Schneider's Grammaire esquimaude du sous-dialect de l'Ungava
(1967) Direction générale du Nouveau-Québec (Québec, Qué.), or A.
Spalding's Salliq: an Eskimo grammar (1969) Dept of Indian
Affairs & Northern Development (Ottawa).

[13] nanug means 'polar bear', but for the sake of a concise
pidgin, & since nanug is an unanalysable morph, I have used
<bear> as its pidgin equivalent.

[14] Use of the relative case <'s> (-up singular) to mark a noun as
a possessor is similarly elementary morphology. As with -ug, it
is complicated by other factors which are surpressed here. See
grammars mentioned in note [12] for details. The possessive case
<Pos> marks the possessor in N-N constructions, but its
morphonemic shape is not certain. Both <Pos> & <'s> occur in N-N
constructions, marking the possessed & the possessor,
respectively. Because neither appears in any other construction,
the use of <Pos> marking the "subject" of these so-called
transitive verbs provides additional support for the analysis of
-taa as -tag+a <Thg+Pos>.

[15] In 'On the notion to be in Eskimo' (in Verhaar(Ed) "The Verb
be & its Synonyms - 2" (1968) Reidel), J. Mey discusses the <-Be-
> which makes a bare nominal into a verbal, allowing inflection
for negation, mood, person & number. His framework assumes that
sentences have verbal heads, & he accordingly downplays the
"nominal sentences" like <that bear>. He realizes that something
is missing in his description, as he says that Eskimo is "a
language that (for all I know) is very unlike anything that so
far has been described in a modern (e.g. generative) framework."

The point of the present discussion is that Eskimo can be, &
should be, analysed as having an unexpressed copula, & that this
equational structure (with an unexpressed copula) is the most
basic structure in Eskimo.

[16] Reported by S.T. Mallon, Inuktitut Education, Yellowknife.

[17] The superficial structure of _if...then..._ sentences is neither
nuclear nor subject-predicate. There is no superficial reason
why either of these words or their associated clauses should be
singled out as the nucleus or the subject. Their nuclear deep
structure rests on the supposition that the functional structure
of all sentences is nuclear. It is this supposition that we call
into question on the basis of Eskimo.

These "parallel comparatives" differ from our algebraic
equational model by not having the freedom of rearrangement. But
this restriction applies only at the point which is optionally
marked by _then_. On either side of that point, the phrases may be
rearranged freely. The semantic interpretation of this point
(whether explicitly marked or not) appears to be pure
"causality". Increases described before that point "cause" the
increases described after it. Thus "the more he practices, the
better he gets & the more he likes it" = "the more he practices,
the more he likes it & the better he gets", ≠ "The better he
gets, the more he practices & the more he likes it".

This semantic observation can motivate a nuclear deep
structure, but the surface structure is clearly _not_ nuclear.
Indeed there appears to be no motivation for a nuclear deep
structure except for the assumption that all deep structures are
nuclear. That assumption is unmotivated & obfuscating for 1 non-
natural language, algebraic notation, & 1 natural language,
Eskimo, is better analysed without it.

[19] One is reminded at this point of Kuroda's derivation of
relative clauses from conjoined sentences. See his article in
Lang (1965)?

[20] See G. Lakoff 'Linguistics & natural logic' p 545-665 in
Davidson & Harman (Ed) _The Semantics of Natural Language_ (1972)
Dordrecht, or J. McCawley _Grammar & Meaning_ (1973) Tokyo.

[21] See my 'Descriptions in natural language' (1974) _Language
Sciences_ 30: 13-19. The semantic representation proposed with
generative semantics is not far from this, but because it is
motivated from within transformational grammar, it also
represents facts about the syntax of expression, & conjunction is
far from being unmarked. See the last part of my 'Integrative
semantics' (1972) _Cahiers de Linguistique_ 2: 19-38 for a closer
criticism.