Last time we'd developed something like the following set of phrase structure rules:

(1)

TP → NP T VP  
VP → V (NP) (PP)  
NP → (Det) (A) N (PP)  
PP → P (NP)

Put these together with a lexicon (which lists words that count as instances of N, A, P, and so on), and you can generate trees like:

(2)

```
TP
  |   |   
NP    T  VP
  |  |   
N    V  NP
  |  |   
I    read  
    |   
    N    PP
    |  | 
    books  
    |   
    P  NP
    |   
    with  
    |   
    A    N
    |   
    interesting    plots
```

The little mini-grammar in (1) has a couple of desirable properties already: it has recursion, and it can handle certain cases of ambiguity [remember?]

And yet, the mini-grammar in (1) is not the final word in grammar. It has at least three serious problems:

(3)  
   a. they're quite unrestrictive; nothing prevents us from writing a rule like VP→NP TP, if we want
   b. they're largely redundant with things we're going to have to state in the lexicon anyway (more about this later)
   c. they turn out not to make enough structural distinctions (more about this later, too)
Consider the VP rule:

\[ VP \rightarrow V \text{ (NP) (PP)} \]

We said before that we’re going to combine these rules with lexical entries to get fragments of English. Lots of lexical choices won’t work out, of course:

(4)  
\begin{enumerate} 
\item a. The dragon \textbf{devoured} the villagers 
\item b. *The dragon \textbf{devoured} 
\end{enumerate} 

(5)  
\begin{enumerate} 
\item a. The dragon \textbf{rejoiced} 
\item b. *The dragon \textbf{rejoiced} his victory 
\end{enumerate} 

(6)  
\begin{enumerate} 
\item a. The dragon \textbf{put} the peasant upon the plate 
\item b. *The dragon \textbf{put} 
\item c. *The dragon \textbf{put} the peasant 
\item d. *The dragon \textbf{put} upon the plate 
\end{enumerate} 

The data in (4-5) are described by a classic observation: some verbs are \textit{transitive} (they require objects) and others are \textit{intransitive} (they can't have objects). And, in fact, as we see in (6), there are verbs with even more extensive requirements.

So in the lexical entry for \textit{put} we’ll need to have the information “needs an NP and a PP”. Once we have that information there, do we really want to restate it in a phrase structure rule?

\[ \rightarrow \textbf{selection}, \text{ which we’ll be talking about more later. Heads get to } \textbf{select} \text{ (or } \textbf{subcategorize}) \]

for certain types of phrases.

Not everything is selected:

(7)  
\begin{enumerate} 
\item a. The dragon devoured the villagers (\textit{yesterday}) (\textit{in Omaha}) 
\item b. The dragon rejoiced (\textit{yesterday}) (\textit{in Omaha}) 
\item c. The dragon put the peasant upon the plate (\textit{yesterday}) (\textit{in Omaha}) 
\end{enumerate} 

phrases like \textit{the villagers}, \textit{the peasant}, and \textit{upon the plate}, which are picky about which heads they cooccur with, are \textbf{complements} of the heads; we'll say that the heads \textbf{select} (or \textbf{subcategorize}) for them.

phrases like \textit{yesterday} or \textit{in Omaha}, which aren't selected, are \textbf{adjuncts}. 
Now for problem (3c); these phrase structure rules give us an insufficiently fine-grained structure:  [judgments and *'s removed for audience participation purposes]

(8)  
   a. John decided on the boat  
   b. John decided on the boat in Omaha  
   c. John decided in Omaha on the boat  
   d. John decided on the boat on the plane

--->complement/adjunct distinction has structural consequences

(9)  John decided on the boat, and Mary did so on the plane

(10)  
   a. a student of physics from Brazil  
   b. a student from Brazil of physics

(11)  
   a. a Brazilian physics student  
   b. a physics Brazilian student

(12)  
   a. ...a student from Rwanda, and one from Brazil  
   b. ...a student of chemistry, and one of physics

(13)  
   a. ...a Rwandan student, and a Brazilian one  
   b. ...a chemistry student, and a physics one

(14)  
   a. an alleged Brazilian student  
   b. a Brazilian alleged student

(15)  
   a. an alleged student from Brazil  
   b. alleged student of physics

(16)  
   a. John knocked on the door twice three times.  
   b. John knocked on the door three times twice.

tests; how do we distinguish between complements and adjuncts?
   • obligatoriness?  
   • relative scope (ambiguity with alleged)  
   • ordering (student with green hair of physics, student of physics with green hair)
   • one-replacement, do so-replacement  
   • pickiness (student/*orange of physics)
   • particular choices of P? (a student of impeccable character)
   • extraction:

(17)  
   a. What subject is she a student of?  
   b. What color hair is she a student with?
Tree construction algorithm (Merge):

(i) Take two things, A and B, and put them together to form a third thing, C.
(ii) Give C the label of either A or B
(iii) Repeat as necessary.

[crusically, A and B may be either lexical items, or previous products of Merge. That is, Merge reapplyes to its own output. In other words, Merge is recursive]

(18)  a. 

```
    A
   /\  
  N  green
 / \    
gegs   
```

    Merge

 b. 

```
    N
   /\  
  A  green
 / \    
gegs  
```

    N Projects

c. 

```
    V
   /\  
  eat  
 / \    
A  green
 / \    
gegs  
```

    Merge

d. 

```
    V
   /\  
  eat  
 / \    
A  green
 / \    
gegs  
```

    V Projects

(19) 

```
    N
   /\  
  N  PP
 / \    
students  PP
 / \    
from   P
 / \    
Brazil  N
 / \    
of   physics
```


These trees resemble the trees generated by the X-bar schema: compare and contrast...

- **XP=** maximal projection (node with label X which is not dominated by any projections with labels X from the same head (terminal node))
- **X=** head (node which dominates no other nodes)
- **X' ("X-bar")=** intermediate projection (node which is neither a head nor an XP)

A new constituency test; coordination

(20)  a. John bought [an apple] and [a lemon]
    b. Mary [bought an apple] and [sold a lemon]

(handle with care: Right Node Raising)

(21)  a. [John bought], and [Mary sold], a shiny new lemon
    b. [John bought], and [Mary sold], a shiny new lemon yesterday

(22)  I [have won the lottery] and [will never work again]

Now, our discussion has mostly been about English. Does every language need all this structure?
Another constituency test: VP-ellipsis

(23)  a. John can speak Maliseet, and Mary can speak Maliseet too.  
     b. John can speak Maliseet, and Mary can ___ too.  \[
     \text{[___ = `speak Maliseet']}
     \]
     c. *John can speak Maliseet, and Mary ___ Maliseet too.  \[
     \text{[___ = `can speak']}\]

(24) \[
\begin{array}{c}
\text{TP} \\
\text{NP} \quad \text{T'} \\
\text{N} \quad \text{T} \\
\text{Mary can} \\
\text{V} \quad \text{NP} \\
\text{speak} \quad \text{Maliseet}
\end{array}
\]
\[
> \text{speak Maliseet is a constituent.}
\]
\[
> \text{can speak isn't.}
\]

convention followed here for examples like (23b):

(25) John can speak Maliseet, and Mary can (speak Maliseet) too.
Maliseet background

• Algonquian language of New Brunswick and Northern Maine
• closely related to Passamaquoddy; less closely to Micmac, Cree, Ojibwe, Wampanoag...
• Rich verbal morphology:

(26) a. ‘t-olom-aph -a -l
   3 away track_{TA} DIR OBV
   ‘S/he heads away, tracking him/her’

b. ‘t-ap- aph -a -l
   3 back.from track_{TA} DIR OBV
   ‘S/he is back from tracking him/her’

c. mihq- aph -a -l
   (3) find track_{TA} DIR OBV
   ‘S/he discovers his/her tracks’

d. motiy- aph -a -l
   (3) heard track_{TA} DIR OBV
   ‘S/he is heard, but not seen, tracking him/her’

e. ‘-koskay- aph -a -l
   3 destroy track_{TA} DIR OBV
   ‘S/he loses his/her tracks’

f. ‘-tehsahq- aph -a -l
   3 high.ground track_{TA} DIR OBV
   ‘S/he tracks him/her on high ground’

(27) a. ‘t-olom-aptu -n
   3 away track_{TI} INAN
   ‘S/he heads away, tracking it’

b. ‘t-ap- aptu -n
   3 back.from track_{TI} INAN
   ‘S/he is back from tracking it’

(28) a. olom-apt -u
   away track_{AI} 3
   ‘S/he heads away, leaving tracks’

b. pet- apt -u
   this.way track_{AI} 3
   ‘S/he arrives, leaving tracks’
(29) \textbf{animate} \hspace{1cm} \textbf{inanimate}

- skitap ‘person’
- amsgocekhan ‘doll’
- pskikhqimins ‘strawberry’
- nitq ‘my eyebrow’

- ponapsq ‘rock’
- wikuwam ‘house’
- saht ‘blueberry’
- nsisoq ‘my eye’

- Agreement with the subject, object, indirect object:

(30) \begin{align*}
\text{kt-ol} \hspace{0.5cm} \text{-ihtu} \hspace{0.5cm} \text{-oni} \hspace{0.5cm} \text{-ya} \hspace{0.5cm} \text{-l} \\
\text{2 \ thus TA+O 1>2 INAN 2PL INANPL} \\
\text{‘I made them for you (pl)’}
\end{align*}

- overt pronouns are mainly for emphasis:

(31) ?? nil k-tokom-ol \textit{pro-drop} kil

\begin{align*}
\text{I} \hspace{0.5cm} 2 \hspace{0.5cm} \text{hit} \hspace{0.5cm} 1>2 \hspace{0.5cm} \text{you} \\
\text{‘I hit you’}
\end{align*}

(32) (??lui) mangia gli spaghetti \textit{[Italian]}

\begin{align*}
\text{he} \hspace{0.5cm} \text{eat-3SG} \hspace{0.5cm} \text{the}_{\text{MPL}} \hspace{0.5cm} \text{spaghetti} \\
\text{‘He’s eating spaghetti’}
\end{align*}

- word order is quite free:

(33) a. \text{N-siwehs n-kisi- mil -a -n -ol \textit{psite oqitonu}-l} \textit{[Bruening 2001, 21]}

\begin{align*}
\text{1- \ brother 1-PERF-give-DIR-INAN-INANP all canoe- INANP} \\
\text{‘I gave my brother all the canoes’}
\end{align*}

b. \text{Nkisimilanol nsiwehs psite oqitonul.}

c. \text{Psite oqitonul nsiwehs nksimilanol.}

d. \text{Nsiwehs psite oqitonul nksimilanol.}

e. \text{Nkisimilanol psite oqitonul nsiwehs.}

f. \text{Psite oqitonul nksimilanol nsiwehs.}
Some theories of languages like Maliseet:

Hale 1983:

(34) 
\[
S \quad \text{(34)}
\]
\[
\text{nsiwehs} \quad \text{nkisimilanol} \quad \text{oqitonul}
\]
\[
\text{my-brother} \quad \text{I-gave} \quad \text{canoes}
\]
\[
\text{‘I gave my brother the canoes’}
\]

Jelinek 1984, Baker 1996:

(35) 
\[
\text{XP}
\]
\[
\text{NP} \quad X’
\]
\[
\text{nsiwehs} \quad \text{NP} \quad X’
\]
\[
\text{‘my-brother’}
\]
\[
\text{oqitonul} \quad X \quad \text{TP}
\]
\[
\text{‘canoes’}
\]
\[
\text{NP} \quad \text{T’}
\]
\[
\text{(pro) T} \quad \text{VP}
\]
\[
\text{‘I’}
\]
\[
\text{(pro) V’}
\]
\[
\text{NP} \quad \text{V’}
\]
\[
\text{nkisimilanol} \quad \text{NP}
\]
\[
\text{‘1-gave-3-InPl’ (pro)}
\]
\[
\text{‘them’}
\]

(36) As for my brother, as for the canoes, I gave them to him.
Maliseet VP-ellipsis

(37) N-ikuwoss ‘t-apqote-htu-n khakon,
    1 mother 3 open TI INAN door
    ‘My mother opened the door...’

   a. ... kenuk nil nt-aluw- apqote-htu-n
      but I 1 unable open TI INAN
    ‘...but I couldn’t open it’

   b. ... kenuk nil nt-aluw-ehtu-n
      but I 1 unable TI INAN
    ‘...but I couldn’t (open the door).’

These mean more or less the same thing.
But I’ll argue that (a) involves pro-drop of the object, while (b) is VP-ellipsis.

VP-ellipsis, argument 1: adverbs

(38) N-ikuwoss menakaciw ‘t-apqote-htu-n khakon,
    1 mother quietly 3 open TI INAN door
    ‘My mother opened the door quietly...’

   a. ... kenuk nil nt-aluw- apqote-htu-n
      but I 1 unable open TI INAN
    ‘...but I couldn’t open it’      [...I couldn’t open it at all]

   b. ... kenuk nil nt-aluw-ehtu-n
      but I 1 unable TI INAN
    ‘...but I couldn’t (open the door quietly).’      [...I opened it, but made noise]

(39) N-siwehs nihikehs miyaw-telom-on,
    1 brother three.times (3) well hit INAN
    ‘My brother hit it (a target) three times...’

   a. ... kenuk nil nt-aluwi-miyaw-telom-on
      but I 1 unable well hit INAN
    ‘...but I couldn’t hit it’      [...not at all]

   b. ... kenuk nil nt-aluw-ehtu-n
      but I 1 unable TI INAN
    ...but I couldn’t (hit it three times)’      [...though maybe I hit it once]
(40) ‘-Kisi-pqa-nom -on -ol ‘kekiw,
3 PERF lift by.hand[I_NAN INANPL all.day
‘He lifted them (weights) all day...’

a. ...kenuk nil nt-aluwi- pqa-nom -on -ol
    but I I unable lift by.hand[I_NAN INANPL
    ‘...but I couldn’t lift them’ [...at all]

b. ...kenuk nil nt-aluwehtu-n -ol
    but I I unable TI INAN INANPL
    ‘...but I couldn’t (lift them all day)’ [...though maybe for a while]

English: VP-ellipsis and adverbs

(41) a. My mother could open the door **quietly**, but I couldn’t (**open the door quietly**)

b. TP
    NP   T’
    my mother T could
    VP
    V’
    AdvP
    open NP quietly
    the door

...but I couldn’t____.

proposal: **same explanation for Maliseet.**
VP-ellipsis, argument 2: objects

(42) Skinuhsis ‘-kisi-sunhom-on ponapsq;
    boy  3 PERF paint, INAN rock
    ‘The boy painted a rock,...’

    a. nil-ote-na n-kisi-sunhom-on
       I FOC also I PERF paint, INAN
       ‘...and I painted it too.’ [we painted the same rock]
       [we painted the same rock]

    b. nil-ote-na n-kis-ehtu-n
       I FOC also I PERF ti INAN
       ‘...and I did (paint a rock) too’ [we painted different rocks]

again, in Maliseet as in English, if you’re eliding the verb, you’re eliding the direct object.

VP-ellipsis: what happens to the VP

The object really is in there....

(43) a. N-ikuwoss ‘t-apqote-htu-n khakon, kenuk nil nt-aluw-ehtu-n
       1 mother 3 open ti inan door but I 1 unable ti inan
       ‘My mother opened the door, but I couldn’t (open the door).’

       b. N-ikuwoss ‘t-apqote-htu-n -ol khakon-ol, kenuk nil nt-aluw-ehtu-n -ol
       1 mother 3 open ti inan inanpl door inanpl but I 1 unable ti inan inanpl
       ‘My mother opened the doors, but I couldn’t (open the doors).’

...but it’s obligatorily missing in VP-ellipsis clauses:

(44) *‘-Kisi-kpote-htu-n khakon, kenuk ‘t-aluw-ehtu-n possiyantestsk
     3 PERF close ti inan door but 3-unable ti inan window
     ‘She closed the door, but she couldn’t close the window’
Conclusion:

VP-ellipsis (in English and Maliseet) affects a constituent which includes the verb, the direct object, and (certain) adverbs:

(45) a. \( N\text{-ikuwoss menakaciw 'kis-apqote-htu-n khakon } \)
    \hspace{1cm} \text{1 mother quietly 3 PERF open Ti INAN door}
    \hspace{1cm} \text{‘My mother opened the door quietly’}

b. TP

\[
\begin{array}{c}
\text{TP} \rightarrow \\
\text{NP} \rightarrow \\
\text{T'} \rightarrow \\
\text{n-ikuwoss} \rightarrow \\
\text{1-mother} \rightarrow \\
\text{XP} \rightarrow \\
\text{3-\text{kis}} \rightarrow \\
\text{3-PERF’} \rightarrow \\
\text{X} \rightarrow \\
\text{hu-n} \rightarrow \\
\text{Ti-INAN’} \rightarrow \\
\text{V} \rightarrow \\
\text{AdvP} \rightarrow \\
\text{menakaciw} \rightarrow \\
\text{‘quietly’} \rightarrow \\
\text{V} \rightarrow \\
\text{-apqote-} \rightarrow \\
\text{‘open’} \rightarrow \\
\text{khakon} \rightarrow \\
\text{‘door’} \rightarrow \\
\end{array}
\]

One moral of the story

Languages are more similar than they appear. Even a language like Maliseet, with very little straightforward evidence for VPs, actually has them if you look hard enough.
Works cited