

Gazdar & Pullum (1982 & 1985)

- thesis: all published arguments for the non-context-freeness of NL are not compelling
 1. folklore
 2. wrong data
 3. formal mistakes
- 30 years of fruitless search for a non-context-free language
- human seem able to parse sentences in linear time

Are natural languages context-free?

embedding of subordinate clauses in **Swiss-German**

- mer d'chind em Hans es huus lönd hälfe aastriiche
we the childs-ACC the Hans-DAT the house-ACC let help paint

NP_1 NP_2 NP_3 VP_1 VP_2 VP_3 "cross serial dependencies"



- *mer d'chind de Hans es huus lönd hälfe aastriiche
we the children-ACC Hans-CC the house-ACC let help paint

embedding of subordinate clauses in **German**

- er die Kinder dem Hans das Haus streichen helfen ließ
he the children the Hans the house paint help let

NP_1 NP_2 NP_3 VP_3 VP_2 VP_1 "nested dependencies"



NL $\not\subset$ CF: Proof Shieber 1985

| | | |
|---------------------------|------------------------------|--------------------------------------|
| Homomorphism: | $f(\text{"laa"}) = c$ | $f(\text{"es huus haend wele"}) = x$ |
| $f(\text{"d'chind"}) = a$ | $f(\text{"hälfe"}) = d$ | $f(\text{"Jan säit das mer"}) = w$ |
| $f(\text{"em Hans"}) = b$ | $f(\text{"aastriiche"}) = y$ | $f(s) = z$ otherwise |

- $f(\text{Swiss-German}) \cap wa^*b^*xc^*d^*y = wa^mb^nc^md^ny$
- $wa^mb^nc^md^ny$ is not context-free (\rightarrow pumping lemma)
- $wa^*b^*xc^*d^*y$ is regular
- context-free languages are closed unter
 - homomorphisms
 - intersection with regular languages
- Swiss-German is not context-free

potential attack points of the proof

- **wrong data**
 - grammaticality judgements
- **case is not a syntactic phenomenon**
 - case is determined by semantics (unterstützen/helfen)
- **the length of the sentences is restricted**
 - Shieber: "Down this path lies tyranny. Acceptance of this argument opens the way to proofs of natural languages as regular, nay, finite. The linguist proposing this counterargument to salvage the context-freeness of natural language may have won the battle, but has certainly lost the war.