WE NEED A THEORY OF COMPUTATION

1. What OT is, and what it is not
   [Scheer 2010]

(1) phonology
   a. to make a theory of phonology you need
      1. a theory of computation and
      2. a theory of representations.
   b. no cheating please:
      either theory must not be reducible to the other. They must be (ontologically) distinct.
   c. what is debatable is how much of the cake is representational and how much is
      computational – but both exist.
      [like other dualistic pairs: Langue vs. Parole, competence vs. performance, lexicon
      vs. online processing, brain vs. mind, diachronic vs. synchronic processes etc.]
   d. the distinction between objects and processes that transform these objects is the trivial
      baseline of all scientific endeavour, especially in the natural sciences: chemistry,
      physics, biology.
   e. it is certainly common ground in the history of phonology since Panini, or more
      recently since the neogrammarians.
   f. Anderson (1985) describes the see-saw movement in the history of phonology
      between computationally and representationally oriented theories, concluding that
      extreme positions are unlikely to hit close to the mark. And, writing in the early 80s
      in autosegmental furor, correctly predicts that what will be next is a strong swing of
      the pendulum towards computation.
   g. representational  computational
      structuralism >  SPE
      >  autosegmentalism >  OT
      >  ??
   h. maybe we can learn from history and try to have a next step built on the conscious
      ambition to grant rights to both computation and representation, and to spend effort
      on both, not just on one.
   i. oh yes: forgot to say what I mean when I talk about representations:
      something that can be ill-formed.
      An SPE feature matrix cannot be ill-formed.
OT

a. is *not* a theory of phonology
b. it is a theory of computation, applied to phonological computation.
c. hence OT has no theory of representations, and has never had the ambition to have or develop genuine representations.
d. it works with the stock of representations inherited from the 80s, in the segmental area not even with that, but rather with SPE-type features alone.

natural inclination of OT towards computation

a. connectionist heritage
b. Prince & Smolensky (1993) were very far removed from "computation is king": their conception is sound and 80s-inspired. In their view, constraints allow us to go from one derivational stage to another, where input- and output-representations were subject to regular well-formedness.
c. this was gradually abandoned / forgotten and "computation is king" took over progressively in OT mainstream practice.
d. natural end point: the final elimination of representations becomes an explicit goal. We have made about 90% of the way, let's wipe out the last representational residue so that the cake will finally be 100% computation. This is roughly what Paul de Lacy (2007) writes in the introduction the CUP Handbook of Phonology that he has edited.

no effort was put into the development of representations (we are still driving a car from the 80s)
representations were demoted to decoration

in the historical development of OT, there was no awareness of Anderson's dualistic imperative.

Representations are decoration in OT

a. this is a fact that follows from the OT architecture
b. in OT, the only locus of decision about (a)grammaticality is the constraint chamber, i.e. computation.
c. hence there is no independent arbitral award coming from representations:
   1. whatever representations say must be said in terms of constraints
   2. but constraints are computation
   3. and may be outranked by other constraints
   4. what representations say is never independent of computation. Representations are the slave of computation.
   5. example
      monsters can be winners
      a line-crossing representation may be bad, bad there is a constraint ranking whereby everything else is worse, so line-crossing is the winning candidate.
d. in an environment where nobody is the slave of nobody
   1. when a representation is ill-formed, it is ill-formed, period. No tampering: the arbitral award is absolute, not relative. Computation can't rescue the thing.
   2. a computation can crash because it is unable to produce a well-formed result.
   => another issue for OT, which always produces a winner. But sometimes there is no (absolute ungrammaticality). Attempted to be doctored by the null parse, well…
(6) proviso
   a. this is all true only with unmarshalled GEN and Richness of the Base
   b. there are various attempts to restrict GEN and ROB, but this is cheating with basic OT tenets (more on that below).

(7) the fact that representations in OT are decoration is a misunderstanding
   a. resulting from the misconception that OT is a theory of phonology.
   b. OT is a theory of computation, and as such needs to work with a theory of representations.
   c. there is no reason to fall prey of this misconception, though. No property of the theory enforces an imperialistic attitude towards representations. Imperialism grows when one is unaware of Anderson's dualistic imperative.
   d. a situation where OT computation coexists with a theory of representations, each autonomous and not the slave of the other, is perfectly feasible.
      There is a minority movement in OT going into this direction (e.g. work by van Oostendorp).

2. Reason #1

(8) loss of velocity of OT, reason #1
   the misconception that phonology reduces, or may reduce, to computation.

(9) Government Phonology
   a. opposite temptation:
      to believe that a theory of representations will suffice to make a good theory of phonology
   b. symmetrical enterprise with respect to OT:
      1. GP does not (really) have a theory of computation
      2. computation is often only decorative, existing at best in prose statements of the kind "and then X spreads to Y" or "and then the floating suffix-initial vowel associates to the final empty nucleus of the stem".

3. Reason #2

(10) loss of velocity of OT, reason #2
     promises not brought home / betrayed
     a. constraint-based computation relates representations whose well-formedness is controlled independently from this computation.
     b. universality of the constraint set
        emergent constraints…
        1. online constraint induction
           machines create constraints, not humans - well…Albright & Hayes (2002)
        2. there is no universal markedness
           the melodic properties of phonological processes are arbitrary (crazy rules), hence markedness constraints are negotiable on a language-specific basis.
c. restriction of the constraint set
   1. overgeneration used to be an issue in the early days, and hence there was a sense that the number of universal constraints should not exceed X, with X being e.g. 200.
   2. as far as I can see, today nobody cares anymore: there are as many constraints as are needed for the description. Just as there were as many rules as were needed for the description.
   3. when machines design constraints, you compare a machine-built grammar that is made of 500 constraints with another one that does 700 constraints. Engineering: you do get the right result, sure, as you did in SPE. But what does that tell us about grammar?

d. Freedom of Analysis
   restricted precisely in order to prevent computation to be able to do anything an its reverse.
   ==> medicine to help representations to become meaningful in an OT environment.
   Blaho et al. (2007)

e. free ranking
   what about universals in OT: they cannot be expressed because of free ranking. So there are undominated constraints…
   Reasons:
   1. some specific ranking either never occurs cross-linguistically (e.g. Pater & Werle 2001),
   2. or it never occurs as a repair although it could (the to-many-repairs problem)

f. constraint violability
   more of the same: undominated constraints can't be violated.
   Example: Strict Layer Hypothesis broken into two violable and two non-violable constraints (Selkirk 1996).

g. anti-derivationalism
   1. among computational systems
      was misguided from its inception: OT makes no statement regarding the communication of different constraint rankings (modules). This communication is serial, as is the communication among modules of the inverted T. Resistance against that was strong but fortunately today this is not an issue anymore:
      - DOT
      - Stratal OT
   2. within computational systems
      - the basic promise of OT
      - its birth act against ordered rules
      - in fulfilment of the connectionist perspective (PDP): parallel computation
      ==> abandoned by McCarthy's OT-CC under the pressure of opacity

h. absence of evaluation of intermediate forms (surface-orientation)
   not true for DOT, Stratal OT and OT-CC, where intermediate forms are evaluated, just as they were in SPE.
i. modularity
scrambling tropism coming from the connectionist DNA:
1. phonetics in phonology (grounded phonology, formant values, etc.)
2. phonology and morphology
   - interspersing of phonological and morphological constraints
   - interface constraints (making direct reference to morpho-syntactic properties)
   - mixing of phonological and morphological instructions within a constraint
3. syntax and phonology
   constraint-based mapping (Align): done in the phonology, and hence dependent on other phonological constraints. Nespor & Vogel (1986) had a regular modular architecture where translation from one module to another was done outside of modular computation: by mapping rules.

j. dominance
weighted constraints…
But maybe this is another issue, more of an alternative or an evolution than not bringing home a promise.

(11) so what is left of OT if nothing of all that is left?
   a. If all these fundamental properties that ground the theory may or may not be followed, pending on personal choice?
   b. if you take textbooks, looking for properties that are common to all OT-based approaches that are around, you end up with something like this:
      1. are universal
         i.e. part of UG (as opposed to emergent from environmental stimuli)
      2. are violable
         i.e. soft (as opposed to absolute, or hard, as in Declarative Phonology)
      3. are freely ranked
         all different rankings are possible grammars
      4. apply only to surface forms
         (as opposed to underlying or derivationally intermediate forms)
      5. belong to one of two major families, markedness and faithfulness constraints.
   c. none of these is still in place.
   d. imagine what would be left of Government Phonology if, say, the nucleus of vowels that alternate with zero were deleted when the zero surfaces.

4. Outlook

(12) OT resembles SPE more and more…
Hulst & Ritter (2000)
   a. engineering
      you always get the right surface result, and that's what counts.
   b. at a conceptual expense
      that in the early days was tried to be kept under control (9th chapter, number of constraints…), but then flooded away.
c. observation:
1. OT tableaus have become a descriptive standard when phonologists talk to each other, as rewrite rules were in the late 70s when nobody believed in them anymore.
2. what you hear at conferences: here is my analysis, there is an appendix with tableaus, you may have a look, but that's not really important, if you don't like my tableaus you can replace them by yours, if you don't like my constraints you can replace them by yours.

(13) Looking ahead
there may be two dangers
a. OT will go the way it came: without any confrontation or argument exchange with its historical competitor, extrinsic rule ordering
b. [theory X vs. theory Y] > theory vs. non-theory
   reaction: the Phonological Theory Agora (PTA)
   Discussion will not be between theory X and theory Y as it has always been, but between people who believe that there ought to be a theory, and those who either believe that we don't need any, or who don't care because you can go to conferences, publish etc. just by measuring this and that and "see whether this concords with previous measurements or not".

(14) what is needed
a. a collective consciousness that we are part of a field, phonology, which like any other scientific endeavour needs
   1. a theory (or theories)
   2. and more specifically a theory of representations and a theory of computation
b. In the past the front lines were too much theory-oriented:
   1. somebody who works on representations (GPers for example) should be aware that they will also need a theory of computation, and get interested in what is out there with sympathy,
   2. the symmetric attitude should be manifested by people who work on computation.

(15) and alas
(or maybe fortunately):
a. theories of computation and theories of representation do not seem to depend on one another in any way:
b. any theory of representation is compatible with any theory of computation, and vice-versa.
c. hence the discussion needs to be led independently:
   1. we are looking for the correct theory of computation
   2. we are looking for the correct theory of representations
d. the only point where both meet is when they compete for the explanation of the same facts: this is the question of how to divide the cake.
   1. that's to be sorted out
   2. but we know in advance that either computational or representational imperialism is a dead end.
References


