TheoRy of Inventive problem Zolving (TRIZ)
(Anglicized as TIPS – never caught on)
G.S. Altshuller, USSR, c.1950-1980

Holdings:
- There exist patterns in patent claims
  Patents are based on similar Working Principles (WP’s)
- Study of $1 \times 10^6$ patents to derive patterns
  Team effort

5 Categories of design
1. Routine design – parametric advancement
2. Routine design – rearrangement of configuration
3. Identify and solve conflict between WP’s
4. Identify new WP’s
5. Identify new functions

3 Observations
1. Design evolution follows a pattern
   Independent of domain
2. Conflicts drive invention
   Methodology of conflict elimination is independent of domain
3. Physical principles are best applied systematically
   $\Sigma$(team knowledge) < all applicable knowledge

TRIZ Process
- Start – functional decomposition and functional structure
- Plus – other benchmarks, specifications, constraints
- Identify – conflicts between above data
- State – conflicts in terms of generalized parameters
- Apply – design principles to resolve conflicts
- Refine – resulting concepts

Generalized Parameters

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<th>Area of moving object</th>
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<th>Volume of moving object</th>
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**Design Principles**

http://www.triz40.com/aff_Principles.htm

Actions for evolving a design

**Correlation matrix of Generalized Parameters to Design Principles**

http://www.triz40.com/aff_Principles.htm (same place)

Design Principle that can be used to solve conflicts between two Generalized Parameters

Match “what wants to be improved” v. “what gets worse as a result”

**Design Principles can be used directly to solve design problems**

http://www.triz40.com/aff_Principles.htm (same place again)

**Example – clothes iron**

Function 1 – transfer force to clothing (to remove wrinkles)

Function 2 – reduce force on user (for comfortable use)

Conflict – heavy for function 1; light for function 2

Generalized function 1 – force (no.10)

Generalized function 2 – weight of moving object (no.1)

Applicable principles – 1,8,18,37

1 – Segmentation → levered counterweight

8 – Anti-weight → foot-operated sandwich

18 – Mechanical vibration → vibrating eccentric weight (another conflict – user comfort)

37 – Thermal expansion → water spray
Example – piping system for transport of metal shot (more specifically, getting pneumatically transported shot around a bend in the pipe without wearing out the pipe)
Function 1 – coating desired to reduce wear
Function 2 – coating not desired because of increased cost and maintenance
Apply principle – Universality (no.6) → use magnet to hold shot in bend to perform coating function

Example – cell phone
Function 1 – be small in the pocket
Function 2 – span from ear to mouth when in use
Apply principle – Dynamism (no.15) → foldable