



White, Brown, and Pink

The Flavors of Tabletop Game Randomness

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Game Designs

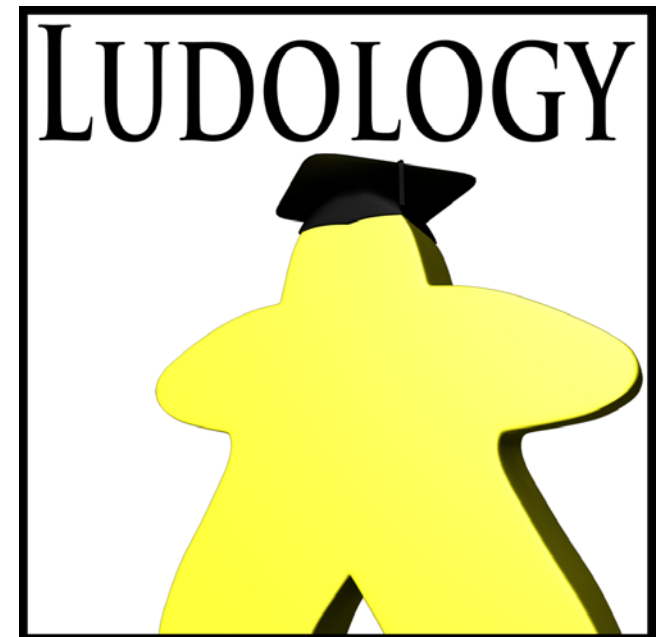
- Space Cadets
- The Ares Project
- The Dragon & Flagon
- The Fog of War
- The Expanse





Podcasts

- The Dice Tower (GameTek)
- Ludology
- NYU Game Center Adjunct Professor





In designing games, a degree of uncertainty is **essential**.
- *Greg Costikyan, Uncertainty in Games (2013)*





Hidden
Information

Skill /
Performance

Opponent
Uncertainty

Randomizers





Randomizers



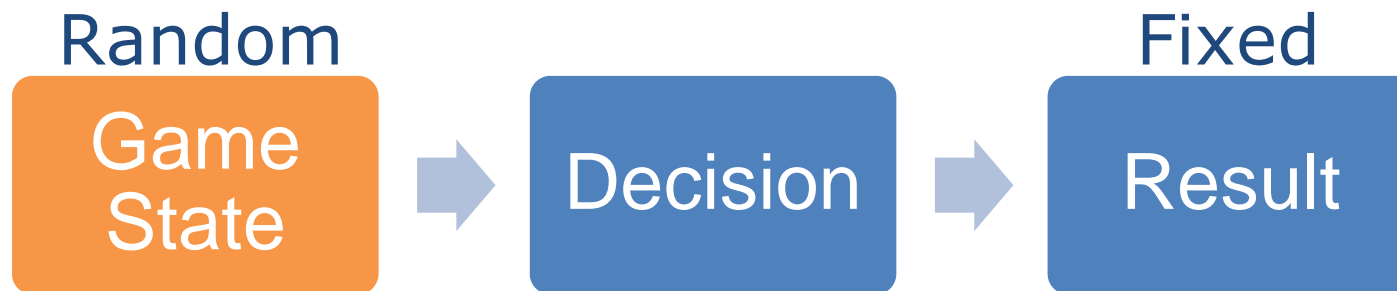
- Die Roll
- Card Draw
- Tile Flip
- Spinner
- Cube Tower







Input Randomness



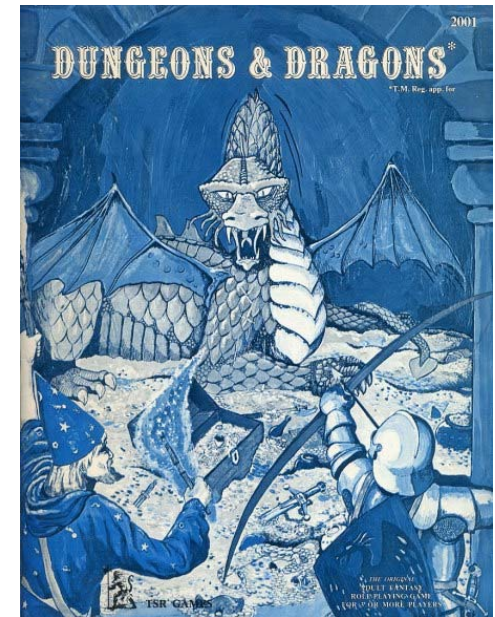


Output Randomness





Output Randomness



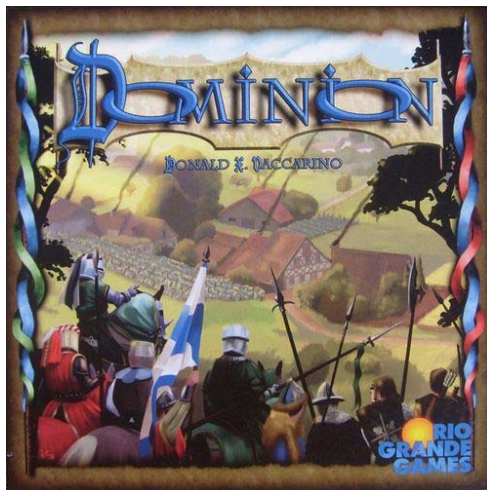
Combat Results Table (CRT)										
Roll 2d6	1:4	1:3	1:2	1:1	2:1	3:1	4:1	5:1	6:1	
2	5/0	4/0	4/0	3/0	3/0	2/0	2/0	2/1	1/0	
3	4/0	4/0	3/0	3/0	2/0	2/0	2/1	1/0	1/1	
4	4/0	3/0	3/0	2/0	1/0	2/1	1/0	1/1	0/1	
5	3/0	3/0	2/0	2/0	2/1	1/0	1/1	0/1	0/2	
6	3/0	2/0	2/0	2/1	1/0	1/1	0/1	0/2	0/3	
7	2/0	2/0	2/1	1/0	1/1	0/1	0/2	0/3	0/4	
8	2/0	2/1	1/0	1/1	0/1	0/2	0/3	0/4	0/4	
9	2/1	1/0	1/1	0/1	1/2	0/3	0/4	0/4	0/5	
10	1/0	1/1	0/1	1/2	0/2	0/4	0/4	0/5	0/6	
11	1/1	0/1	1/2	0/2	0/3	0/4	0/5	0/6	0/7	
12	0/1	1/2	0/2	0/3	0/4	0/5	0/6	0/7	0/8	

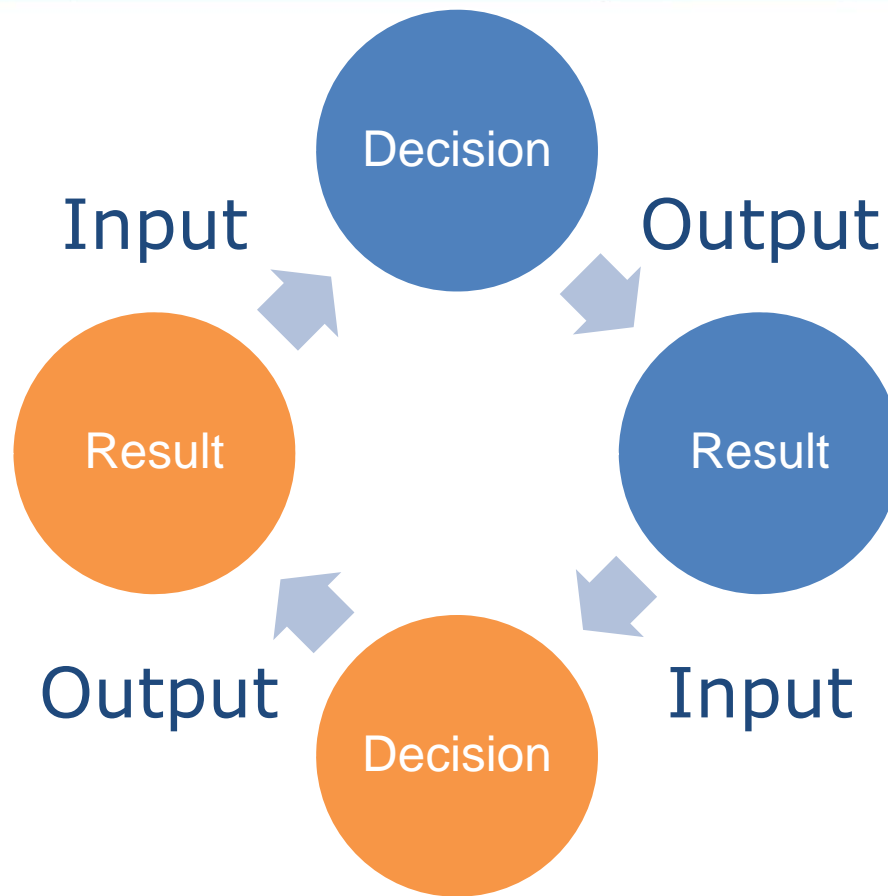
Directions: After applying any modifiers as outlined below, roll two dice and consult the CRT. Results are given as losses to attacker/defender. **Red numerals are a reminder that in Combats, the first attacker loss must be taken as a step reduction.** In Assaults, the attacker must take all losses as step reductions.





Input Randomness







Input Randomness

- Strategic
- High level of control
- Skillful

Output Randomness

- Tactical
- Feel random
- Lower skill





Input Randomness

- Strategic
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But... Wargames?





Axes of Randomness

- Input / Output
- Correlation





Correlation

$$n(t_1), n(t_2), n(t_3), n(t_4), \dots$$

If you know $n(t_x)$, how much do you know about $n(t_{x+1})$?





White Noise

You know nothing

There is zero correlation between the last result and the next result.

The most common type of randomness in games.





Brown Noise

You know a lot

There is a very high correlation between the last result and the next result.

*Example: Flip a coin. Heads, add 1.
Tails, subtract 1.*

Also called *Random Walk Noise*.

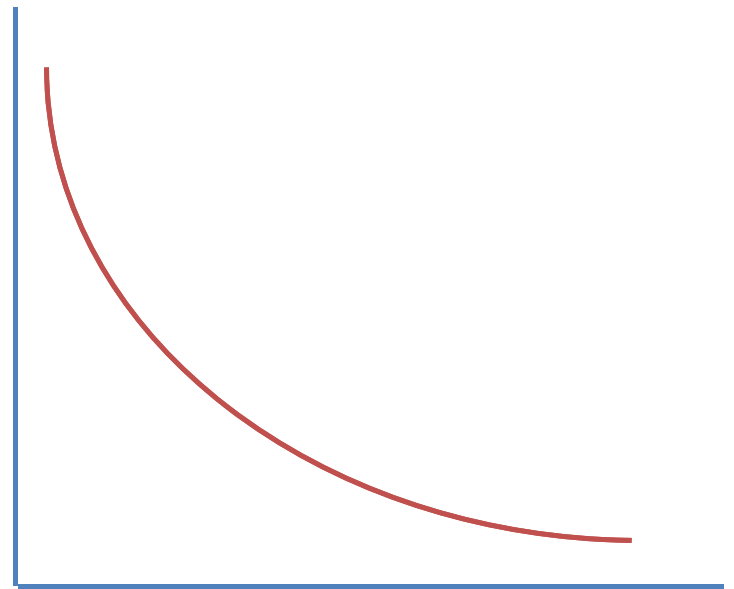




Pink Noise

*You have a pretty good idea,
but could be wrong.*

There is a big chance of a
small change, and decreasing
chances of larger changes.





Humans Like Pink Noise

- Music and Speech: Pitch and Loudness are Pink
(Voss & Clark, 1975)
- Financial Systems: Economic Cycles are Pink
- “Black Swan” events arise from Pink Noise
- Called ‘fractal noise’ by Mandelbrot





Schoko & Co (1987)

Supply of cacao and demand for chocolate determined by a card draw.

White Noise





Crude/McMulti (1974)

Roll two dice – On doubles, economy changes to a new state.

White / Brown Noise



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ECONOMIC SITUATION

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Prosperity

CHANGE IN CONSUMER DEMAND	10	TREND	↓
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ACTUAL PRICES (in Millions of \$)

Industrial installations	Purchase	Sale
Drilling rig	16	12
Gas station	100	60
Refinery	160	100
Well pump	—	75

The first pump on the game field cost \$10 Milj.
The second \$20 Milj. The third \$30 Milj. and so on.

CHANGE IN THE ECONOMIC SITUATION

Dice roll	Economic situation	Dice roll	Economic situation
• •	Rapid growth	• •	Downturn
• •	Downturn	• •	Downturn
• •	Downturn	• •	Depression

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ECONOMIC SITUATION

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Expansion

CHANGE IN CONSUMER DEMAND	7	TREND	↑
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ACTUAL PRICES (in Millions of \$)

Industrial installations	Purchase	Sale
Drilling rig	9	5
Gas station	66	32
Refinery	96	50
Well pump	—	60

The first pump on the game field cost \$10 Milj.
The second \$20 Milj. The third \$30 Milj. and so on.

CHANGE IN THE ECONOMIC SITUATION

Dice roll	Economic situation	Dice roll	Economic situation
• •	Recovery	• •	Expansion
• •	Rapid growth	• •	Rapid growth
• •	Rapid growth	• •	Prosperity

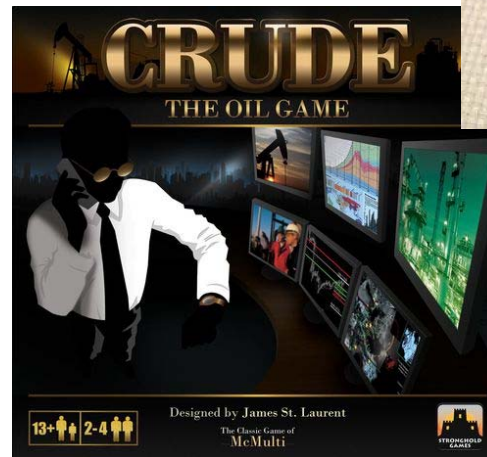




Crude (2012)

Roll two dice – Add difference to an accumulator. When ≥ 8 , change.

Pink Noise

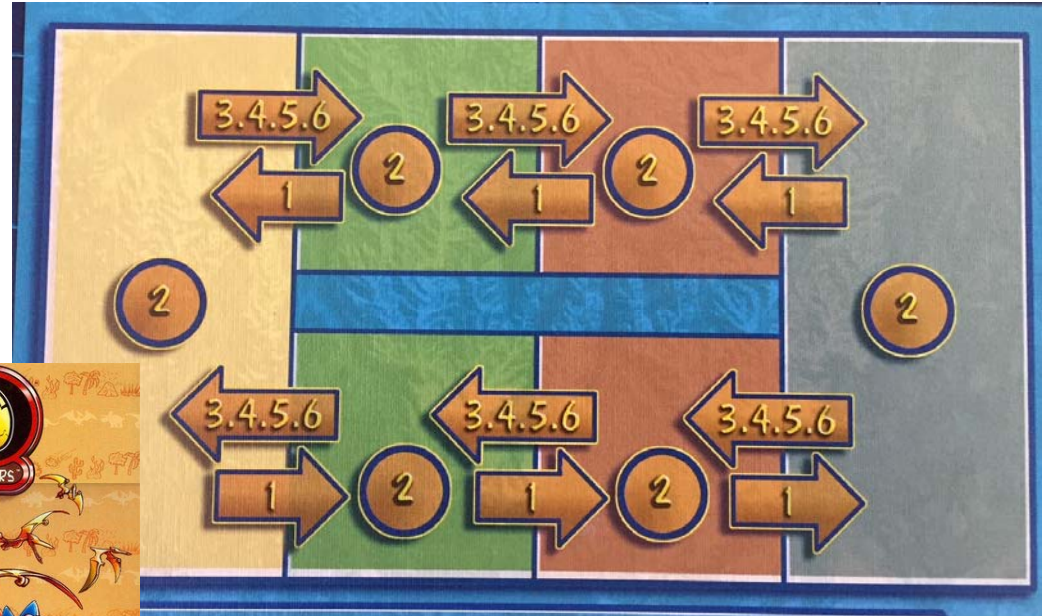
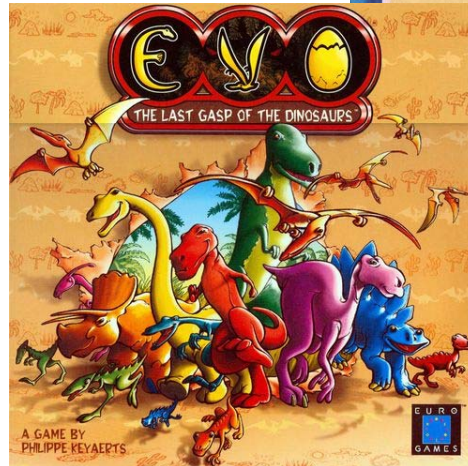




Evo (2001)

Roll die to move around environment track.

Brown Noise

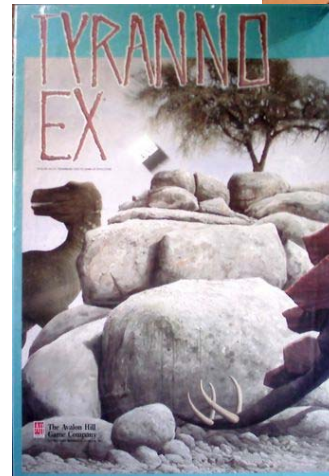




Tyranno Ex (1990)

Face up tokens define environment.
When face down exceeds face up,
environment change. Possible
cascades.

Pink Noise



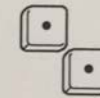


Generating Pink Noise

- Not simple to generate exactly
- Constraint from where you are to where you're going

- *Dice Delta*
- *Exploding Dice*
- *Card distribution*
- *Multiple dice*
- *Extend the extremes*

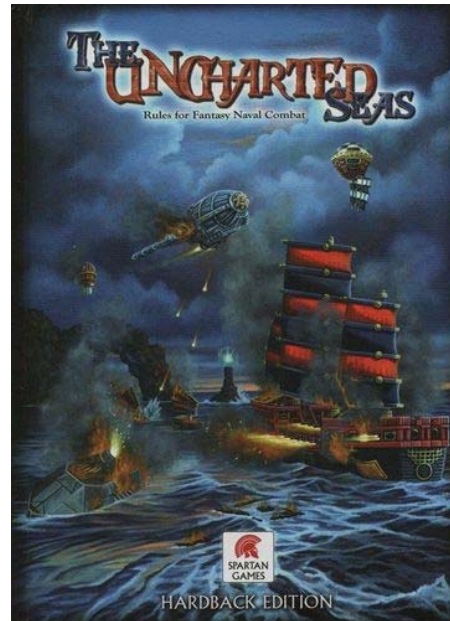
Δ A15.1 HEAT OF BATTLE	
DR follows any Original 2 MC/Rally DR	
NA to Banzai, Berserk, Climbing, Crew, Hero, Human Wave, Panji MC, Parachute, PRC, Self-Rally, Swimming, Unarmed, Wading Infantry/Cavalry	
DR	Result
≤ 6	Hero Creation
5-8	Battle Hardening
9-11	Berserk †
≥ 12	Surrender *
* Treat as Berserk if: Japanese, Gurkhas, Partisans, Fanatics, Commissars, SS vs Russians, or subject to No Quarter (A15.5)	
* Treat as Battle Hardening if: Japanese in Pillbox (G1.62) or Cave (G11.97) or if Assaulting/	





Exploding Dice

- 1-3: Miss
- 4-5: 1 Hit
- 6: 2 Hits and Reroll

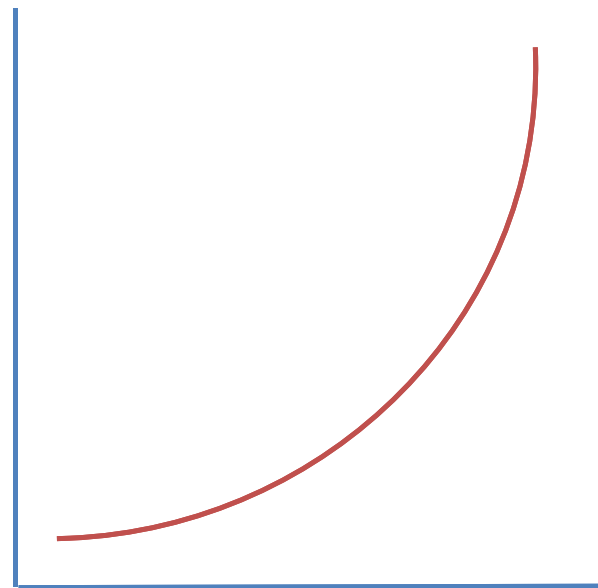




Violet Noise

You don't know where you're going, but you ain't staying here.

There is a small chance of a small change, and increasing chances of larger changes.





Design Tips

Consider Input versus Output Randomness

Planning, strategy, analysis paralysis

People Like Pink Noise

Try to be between totally random and totally certain





Thank you! Questions?

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