The Meaning of Meaning

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Principles of Complex Systems, Vols. 1 & 2
CSYS/MATH 300 and 303, 2021–2022| @pocsvox

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Vermont Advanced Computing Core | University of Vermont

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The meaning of meaning:

"Ousiometrics and Telegnomics: The essence of meaning conforms to a two-dimensional powerful-weak and dangerous-safe framework with diverse corpora presenting a safety bias"

Dodds et al.,
, 2021. [5]

What does meaning even mean?

- From the smack-tweeting Merriam-Webster:[1]
  "The thing that is conveyed especially by language"
- What are the essential characteristics of meaning?
- Does essential meaning meaningfully span some kind of space?

[1] Life goal: Never get owned by a dictionary on social media

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This is not easy:

"Abed's Uncontrollable Christmas"

- Abed searches for the meaning of Christmas (in stop animation)
- Abed Nadir: [opens present] "It's the first season of Lost on DVD."
- Pierce Hawthorne: "That's the meaning of Christmas?"
- Abed Nadir: "It's a metaphor. It represents lack of payoff."

"Introduction to Teaching"

Abed Nadir: "I thought the meaning of people was somewhere in here. Then I looked inside Nicolas Cage and I found a secret—people are random and pointless."

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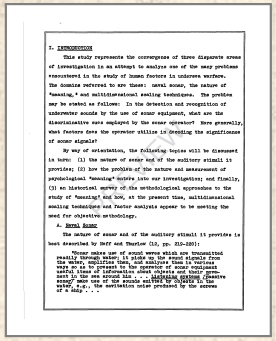
The meaning of pings:



"A factorial study of complex auditory stimuli (passive sonar sounds)"

L. M. Solomon,
Unpublished doctor's dissertation, University of Illinois, , , 1954. [22]

From the introduction:

'This study represents the convergence of three disparate areas of investigation in an attempt to analyze one of the many problems encountered in the study of human factors in undersea warfare.
The domains referred to are these:

- naval sonar,
- the nature of "meaning,"
- and multidimensional scaling techniques.

The problem may be stated as follows: In the detection and recognition of underwater sounds by the use of sonar equipment, what are the discriminative cues employed by the sonar operator?
More generally, what factors does the operator utilize in decoding the significance of sonar signals?'

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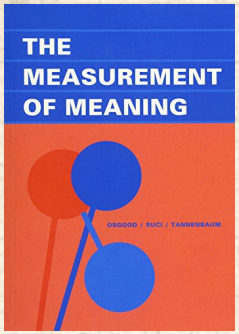
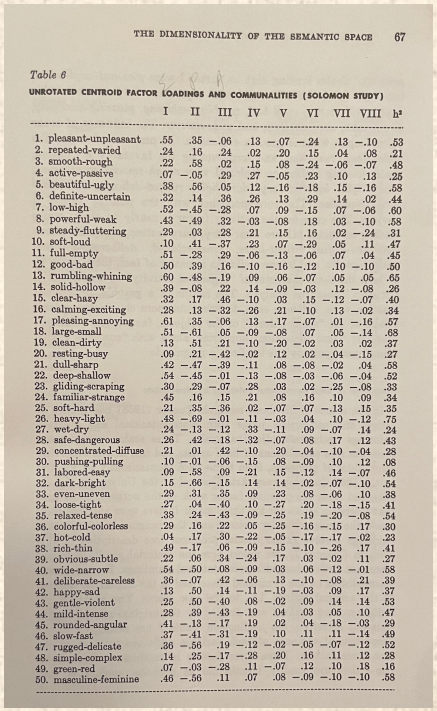
From pings to things:



"The Measurement of Meaning" by Osgood, Suci, and Tannenbaum (1957). [14]



THE DIMENSIONALITY OF THE SEMANTIC SPACE 67

Table 6

UNROTATED CENTROID FACTOR LOADINGS AND COMMUNALITIES (SOLOMON STUDY)

	I	II	III	IV	V	VI	VII	VIII	h^2
1. pleasant-unpleasant	.55	.35	−.06	.13	−.07	−.24	.13	−.10	.53
2. repeated-varied	.24	.16	.24	.02	.20	.15	.04	.08	.21
3. smooth-rough	.22	.58	.02	.15	.08	−.24	−.06	−.07	.48
4. active-passive	.07	−.05	.29	.27	−.05	.23	.10	.13	.25
5. beautiful-ugly	.38	.56	.05	.12	−.16	−.18	.15	−.16	.58
6. definite-uncertain	.32	.14	.36	.26	.13	.29	.14	.02	.44
7. low-high	.52	−.45	−.28	.07	.09	−.15	.07	−.06	.60
8. powerful-weak	.43	−.49	.32	−.03	−.08	.18	.03	−.10	.58
9. steady-fluttering	.29	.03	.28	.21	.15	.16	.02	−.24	.31
10. soft-loud	.10	.41	−.37	.23	.07	−.29	.05	.11	.47
11. full-empty	.51	−.28	.29	−.06	−.13	−.06	.07	.04	.45
12. good-bad	.50	.39	.16	−.10	−.16	−.12	.10	−.10	.50
13. rumbling-whining	.60	−.48	−.19	.09	.06	−.07	.05	.05	.55
14. solid-hollow	.39	−.08	.22	.14	−.09	−.03	.12	−.08	.26
15. clear-hazy	.32	.17	.46	−.10	.03	.15	−.12	−.07	.40
16. calming-exciting	.28	.13	−.32	−.26	.21	−.10	.13	−.02	.34
17. pleasing-annoying	.61	.35	−.06	.13	−.17	−.07	.01	−.16	.57
18. large-small	.51	−.61	.05	−.09	−.08	.07	.05	−.14	.68
19. clean-dirty	.13	.51	.21	−.10	−.20	−.02	.03	.02	.37
20. resting-busy	.09	.21	−.42	−.02	.12	.02	−.04	−.15	.27
21. dull-sharp	.42	−.47	−.39	−.11	.08	−.08	−.02	.04	.58
22. deep-shallow	.54	−.45	−.01	.13	−.08	−.03	−.06	−.04	.52
23. gliding-scraping	.30	.29	−.07	.28	.03	.02	−.25	−.08	.33
24. familiar-strange	.45	.16	.15	.21	.08	.16	.10	.09	.34
25. soft-hard	.21	.35	−.36	.02	−.07	−.07	−.13	.15	.35
26. heavy-light	.48	−.69	−.01	−.11	−.03	.04	.10	−.12	.75
27. wet-dry	.24	−.13	−.12	.33	−.11	.09	−.07	.14	.24
28. safe-dangerous	.26	.42	−.18	−.32	−.07	.08	.17	.12	.43
29. concentrated-diffuse	.21	.01	.42	−.10	.20	−.04	−.10	−.04	.28
30. pushing-pulling	.10	−.01	−.06	−.15	.08	−.09	.10	.12	.08
31. labored-easy	.09	−.58	.09	−.21	.15	−.12	.14	−.07	.46
32. dark-bright	.15	−.66	−.15	.14	.14	−.02	−.07	−.10	.54
33. even-uneven	.29	.31	.35	.09	.23	.08	−.06	.10	.38
34. loose-tight	.27	.04	−.40	.10	−.27	.20	−.18	−.15	.41
35. relaxed-tense	.38	.24	−.43	−.09	−.25	.19	−.20	−.08	.54
36. colorful-colorless	.29	.16	.22	.05	−.25	−.16	−.15	.17	.30
37. hot-cold	.04	.17	.30	−.22	−.05	−.17	−.17	−.02	.23
38. rich-thin	.49	−.17	.06	−.09	−.15	−.10	−.26	.17	.41
39. obvious-subtle	.22	.06	.34	−.24	.17	.03	−.02	.11	.27
40. wide-narrow	.54	−.50	−.08	−.09	−.03	.06	−.12	−.01	.58
41. deliberate-careless	.36	−.07	.42	−.06	.13	−.10	−.08	.21	.39
42. happy-sad	.13	.50	.14	−.11	−.19	−.03	.09	.17	.37
43. gentle-violent	.25	.50	−.40	.08	−.02	.09	.14	.14	.53
44. mild-intense	.28	.39	−.43	−.19	.04	.03	.05	.10	.47
45. rounded-angular	.41	−.13	−.17	.19	.02	.04	−.18	−.03	.29
46. slow-fast	.37	−.41	−.31	−.19	.10	.11	.11	−.14	.49
47. rugged-delicate	.36	−.56	.19	−.12	−.02	−.05	−.07	−.12	.52
48. simple-complex	.14	.25	−.17	−.28	.20	.16	.11	.12	.28
49. green-red	.07	−.03	−.28	.11	−.07	.12	.10	.18	.16
50. masculine-feminine	.46	−.56	.11	.07	.08	−.09	−.10	−.10	.58

- Osgood et al. used semantic differentials and factor analysis to identify a basis of three variables for meaning-space:
  - Evaluation: bad ↔ good
  - Potency: weak ↔ strong
  - Activity: passive ↔ active
- 100s of students, 10s of things, 50 semantic differentials
- "EPA framework"

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Semantic differentials from Osgood et al.:[14]

1. pleasant-unpleasant
2. repeated-varied
3. smooth-rough
4. active-passive
5. beautiful-ugly
6. definite-uncertain
7. low-high
8. powerful-weak
9. steady-fluttering
10. soft-loud
11. full-empty
12. good-bad
13. rumbling-whining
14. solid-hollow
15. clear-hazy
16. calming-exciting
17. pleasing-annoying
18. large-small
19. clean-dirty
20. resting-busy
21. dull-sharp
22. deep-shallow
23. gliding-scraping
24. familiar-strange
25. soft-hard
26. heavy-light
27. wet-dry
28. safe-dangerous
29. concentrated-diffuse
30. pushing-pulling
31. labored-easy
32. dark-bright
33. even-uneven
34. loose-tight
35. relaxed-tense
36. colorful-colorless
37. hot-cold
38. rich-thin
39. obvious-subtle
40. wide-narrow
41. deliberate-careless
42. happy-sad
43. gentle-violent
44. mild-intense
45. rounded-angular
46. slow-fast
47. rugged-delicate
48. simple-complex
49. green-red
50. masculine-feminine

Definitions:

- Ousiometrics: The quantitative study of the essential meaningful components of an entity, however perceived.
- Used in philosophical and theological settings, the word ‘ousia’ comes from Ancient Greek οὐσία.
- To be distinguished from semantics, semiotics, ...
- οὐσία is the etymological root of the word ‘essence’.
- Ousiometry, ousiometer, ousiograms, ...
- Telegnomics: The distant sensing of knowledge (∼ distant reading [13])

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Essential dimensions captured by emotion:

- Late 1800s: Three dimensional representation of emotion postulated by Wendt. [23, 17]
- 1970s: Mehrabian and Russell explicitly port EPA framework: [8, 9]
  - Evaluation $\sim$ Pleasure/Valence ($\sim$ Happiness)
  - Potency $\sim$ Dominance
  - Activity $\sim$ Arousal
- VAD has become standard nomenclature even though emotion is less general than meaning.
- Explicit presumption of independence of VAD dimensions, has hardened as fact.
- Intention that VAD $\equiv$ EPA has become lost in literature. [2]

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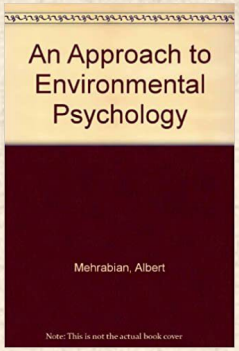

"An Approach to Environmental Psychology."

by Mehrabian and Russell (1974). [8]

THE BASIC EMOTIONAL IMPACT OF ENVIRONMENTS

ALBERT MEHRABIAN AND JAMES A. RUSSELL
University of California, Los Angeles

"The basic emotional impact of environments"

Mehrabian and Russell,
Perceptual and motor skills, **38**, 283–301, 1974. [9]

> *"Semantic differential studies, in particular, have shown that human judgments of diverse samples of stimuli can be characterized in terms of three dimensions: evaluation, activity, and potency. We have termed the corresponding emotional responses pleasure, arousal, and dominance."*

> *"Thus, each dimension is, in principle, functionally independent of the other two; none of the three dimensions could be subsumed by the others."*

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Major problems with measuring essential meaning:

1. **Scale**: Originally 10s and 100s of words $\rightarrow$ now 10,000s + online rating.
2. **The focus on types alone and not tokens:** Missing the forest for the book of tree species.
3. **The use of Likert scales for semantic differentials:** Solid but can be improved upon.
4. **Limitations of factor analysis for a large number of categorical dimensions:** Ousiograms will help sort things out.
5. **The misalignment between expert-chosen, end-point descriptors and dimensions of essential meaning:** How to guide raters to score VAD dimensions?

   Solution is to always perform factor analysis (SVD).

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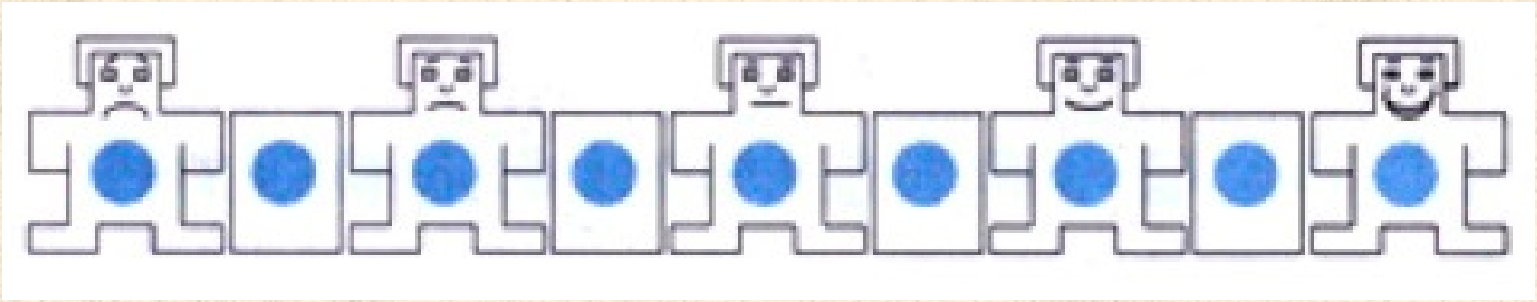
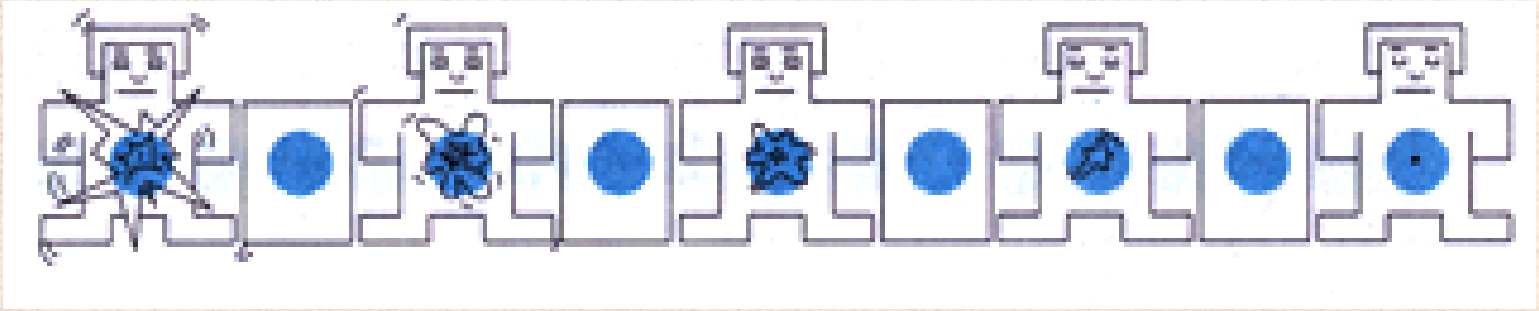
1999 ANEW study—three 1–9 scales: [4]

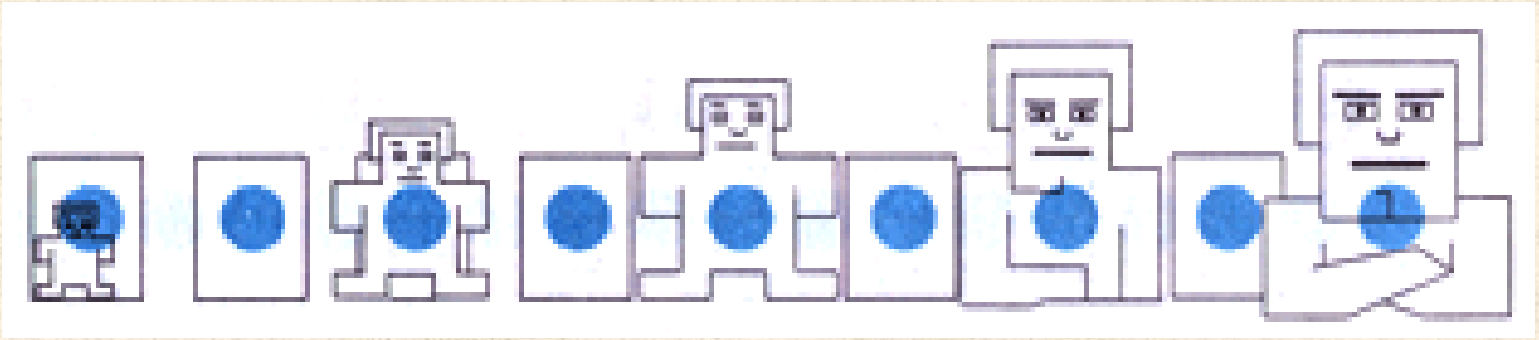
valence:



arousal:



dominance:



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ANEW study: Valence ∼ Happiness:

- Valence scale presented to participants as a ‘happy-unhappy scale.’
- Participants were further told:

  “At one extreme of this scale, you are happy, pleased, satisfied, contented, hopeful. ...

  The other end of the scale is when you feel completely unhappy, annoyed, unsatisfied, melancholic, despaired, or bored.”
- The Hedonometer was always about essential meaning.

We now know that ANEW is a no-no:

- Problem: Expert-chosen list of ∼ 1,000 words.
- Fine words but poorly cover real texts [16].
- Wrongly suggests Arousal and Dominance are minimal relative to Valence.

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Remeasuring meaning:

Obtaining Reliable Human Ratings of Valence, Arousal, and Dominance for 20,000 English Words

Saif M. Mohammad
National Research Council Canada

Abstract

Words play a central role in language and thought. Research has shown that the primary dimensions of meaning are valence, arousal, and dominance (VAD). We present the NRC VAD Lexicon, which has human ratings of valence, arousal, and dominance for more than 20,000 English words. We use Best–Worst Scaling to obtain fine-grained scores, and we show that they are highly reliable. Perhaps most importantly, this paper outlines a general method for creating word–emotion lexicons with reliable scores even for words rarely found in traditional dictionaries. We also show that these new emotionally rich lexicons help in detecting subtle differences in the shared understanding of valence, arousal, and dominance that people have for words, as made evident in their language use.

1 Introduction

Words are the smallest meaningful utterances in a language. They play a central role in our understanding and descriptions of the world around us. Some believe that the structure of a language system is closely tied to the thought and cognitive behavior also the SapirWhorf hypothesis). Several influential frame analysis studies in psychology have argued that all words can be largely distinguished by three dimensions of meaning: are valence (pleasantness, negativeness), arousal (excitedness), and dominance (powerful vs. weak). Osgood et al. (1957) were perhaps the first to show this in their pioneering work. Russell (1980) and Bradley et al. (1992) have argued that these three dimensions are largely independent, and hence a person's affective state can be represented by a point in the 3-dimensional space of valence, arousal, and dominance. For example, the word *banquet* indicates more pleasantness than the word *funeral*, but it indicates more arousal than the word *funeral*. Similarly, the word *anger* indicates more arousal than *fury*, and *fight* indicates more dominance than *victim*.

Access to these degrees of valence, arousal, and dominance of words is beneficial for a number of applications, including those in natural language processing (e.g., automatic sentiment and emotion analysis), in psychology (e.g., as a tool for understanding how humans represent and use language), in psychology (e.g., for understanding the connotative meanings of words), and in the social sciences (e.g., for understanding relationships between people, and even in evolutionary linguistics (e.g., for understanding how language and feelings have evolved to give us our present day).

Warriner et al., 2013), were created using rating scales and then scaling them. Sentiment lexicons, on the other hand, have been created using Best–Worst Scaling (Kiritchenko and Mohammad, 2016). These include inconsistencies in annotations by different annotators, inconsistencies in annotations by the same annotator, scale region bias (annotators choosing to use only parts of the scale), and scale end problems associated with a fixed granularity.

In this paper, we describe how we obtained the emotion ratings for the NRC VAD Lexicon. It has human ratings for more than 20,000 commonly used English words by crowdsourcing. Notably, we use a comparative annotation technique called Best–Worst Scaling (BWS) that addresses the limitations of traditional rating scales (Louviere et al., 2015; Kiritchenko and Mohammad, 2016). The scores are then projected onto well-known scales in the interval from 0 (lowest) to 1 (highest). In (Mohammad, 2018), we showed that the NRC VAD Lexicon is the largest manual lexicon in the world of its kind.

Proceedings of The Annual Conference of the Association for Computational Linguistics (ACL), 2018.

NRC Lexicon Publication Record

"Obtaining Reliable human ratings of valence, arousal, and dominance for 20,000 English words"

Saif M. Mohammad,
Proceedings of The Annual Conference of the Association for Computational Linguistics (ACL), **38**, , 2018. [11]

Moving beyond Likert scales:

- Best-worst scaling
- Ask raters to examine n things once, and choose the best and worst according to some criterion.
- For $n = 4$, the are 6 pair comparisons of Things.
- Choosing best and worst gives 5 orderings: $\tau_1 > \tau_2, \tau_3 > \tau_4$.
- Things end up with scores in $[0, 1]$.

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NRC VAD Lexicon [11]

VAD endpoints:	Paradigm words and phrases presented to raters: [12]
highest valence	happiness, pleasure, positiveness, satisfaction, contentedness, hopefulness
lowest valence	unhappiness, annoyance, negativeness, dissatisfaction, melancholy, despair
highest arousal	arousal, activeness, stimulation, frenzy, jitteriness, alertness
lowest arousal	unarousal, passiveness, relaxation, calmness, sluggishness, dullness, sleepiness
highest dominance	dominant, in control of the situation, powerful, influential, important, autonomous
lowest dominance	submissive, controlled by outside factors, weak, influenced, cared-for, guided

Major problem 5: Imposing dimensions through clouds of endpoint descriptors.

NRC VAD study: 20,007 words:

Standard correlations suggests a bit of Barney Rubble:

$$R(V, A) \simeq -0.268$$
$$R(A, D) \simeq 0.302$$
$$R(D, V) \simeq 0.488$$

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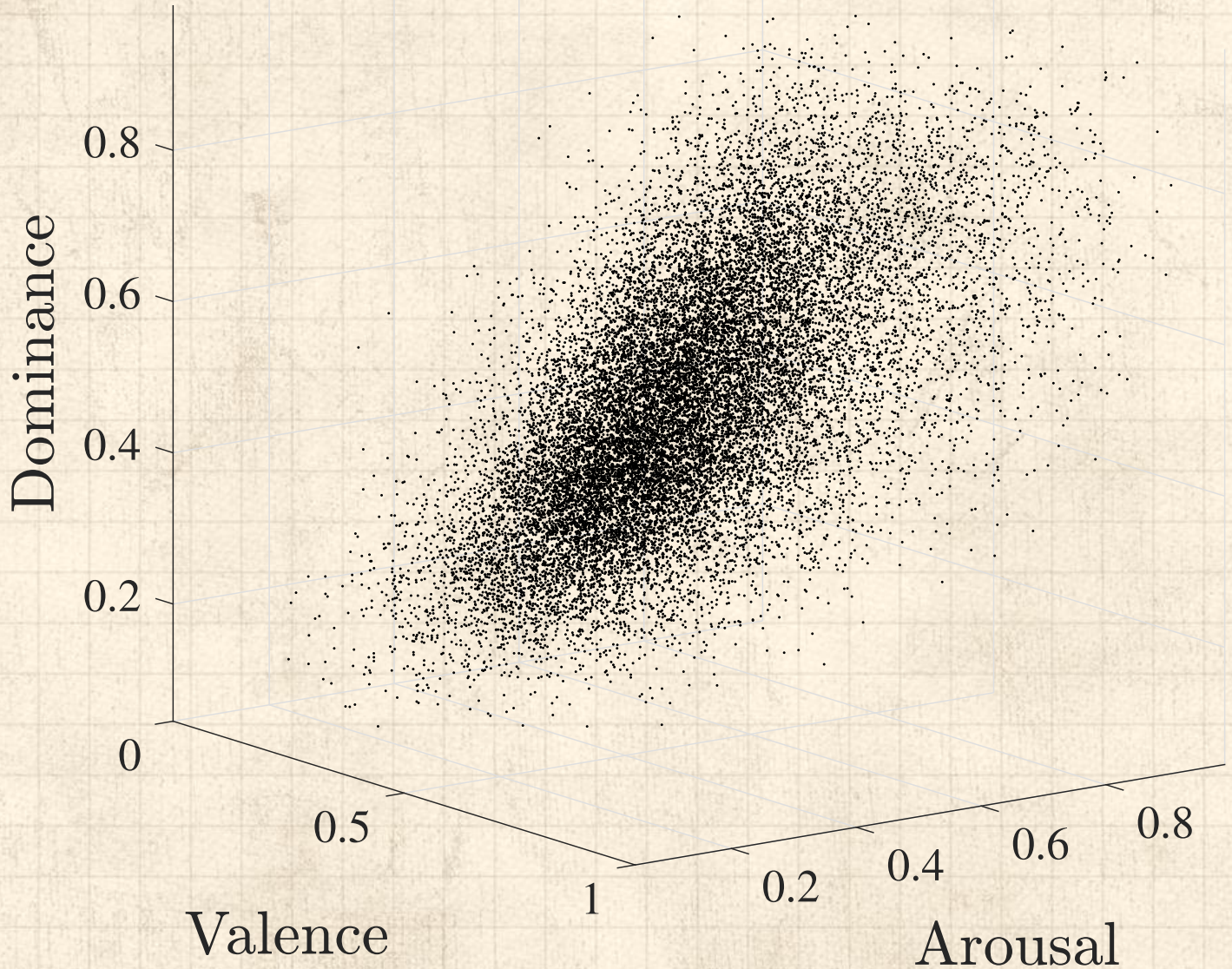
The Delicious English Muffin of Meaning:[1]



[1] Apricot jam, always.

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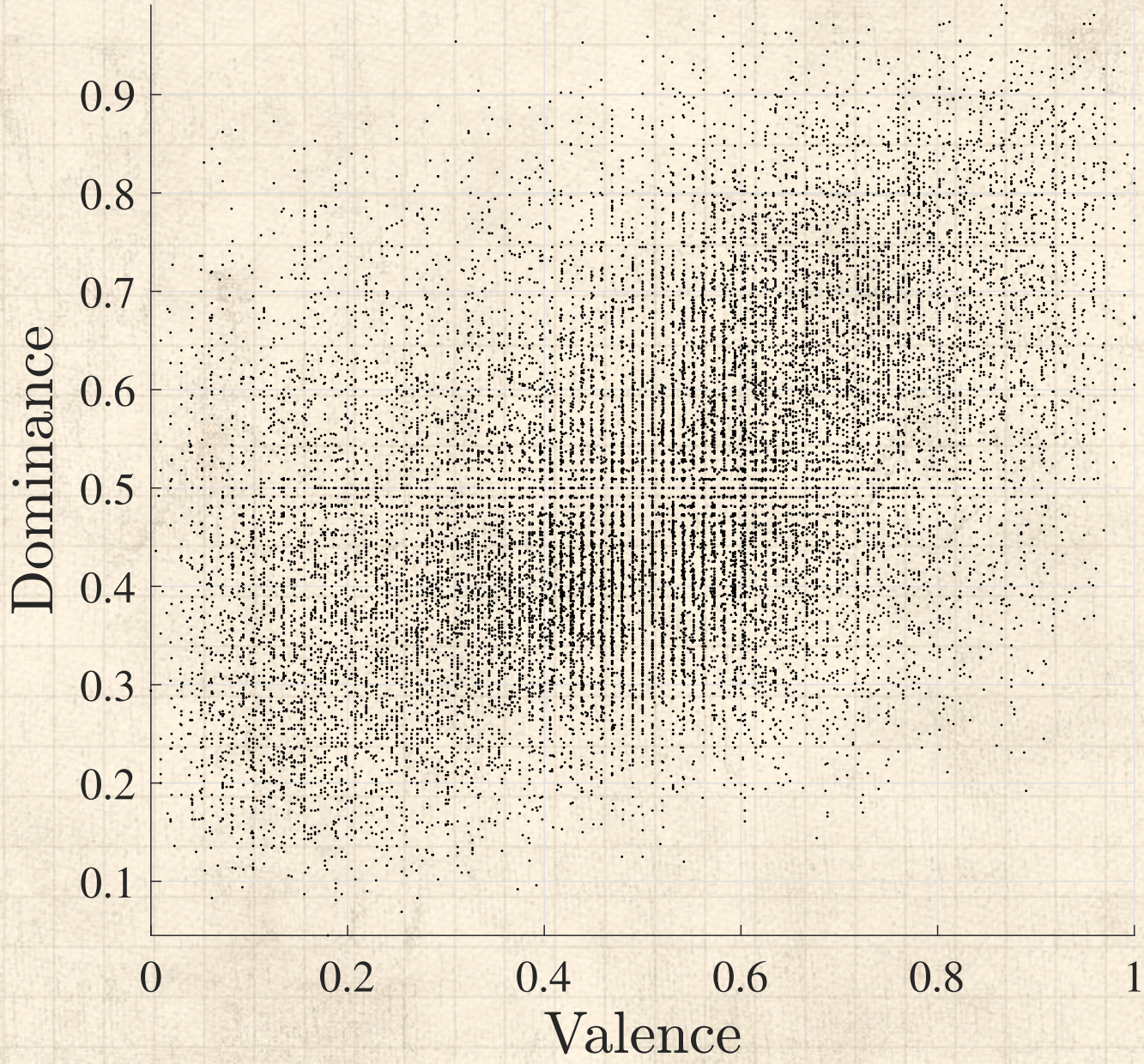
$R(D, V) \simeq 0.488$



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Release the Hounds by which we mean Singular Value Decomposition:

Variance explained:

- VAD: 44.4%, 28.0%, and 27.6%.
- Apply SVD.
- Singular values: $\sigma_1 \simeq 34.1$, $\sigma_2 \simeq 27.2$, and $\sigma_3 \simeq 13.8$,
- For what will be Goodness-Energy-Structure (GES): 55.6%, 35.3%, and 9.1%
- Rotate in G-E plane by $\pi/4$ for what will be Power-Danger-Structure (PDS) 45.5%, 45.5%, 9.1%
- Interpretability enhancements: Ousiograms.

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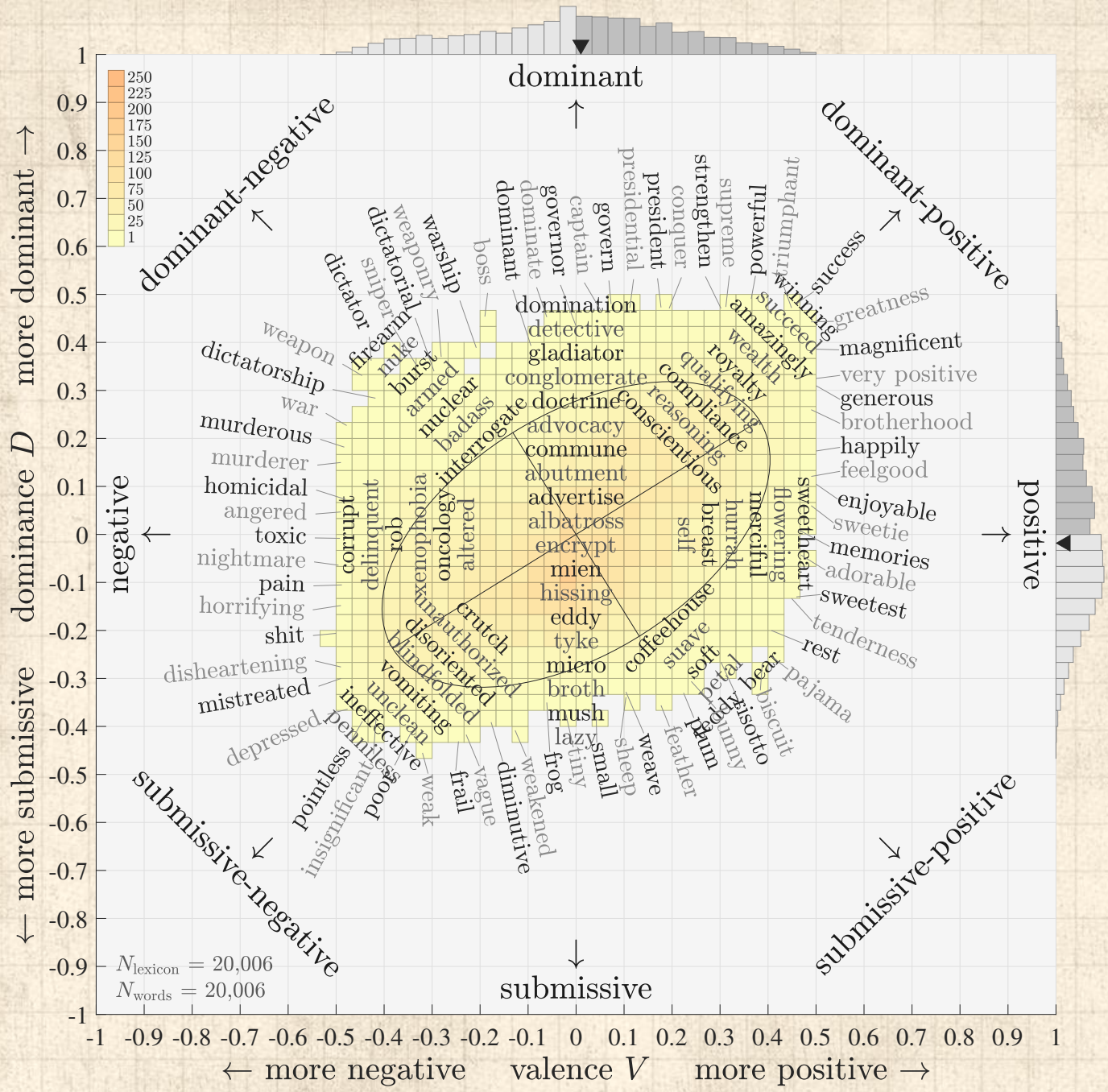

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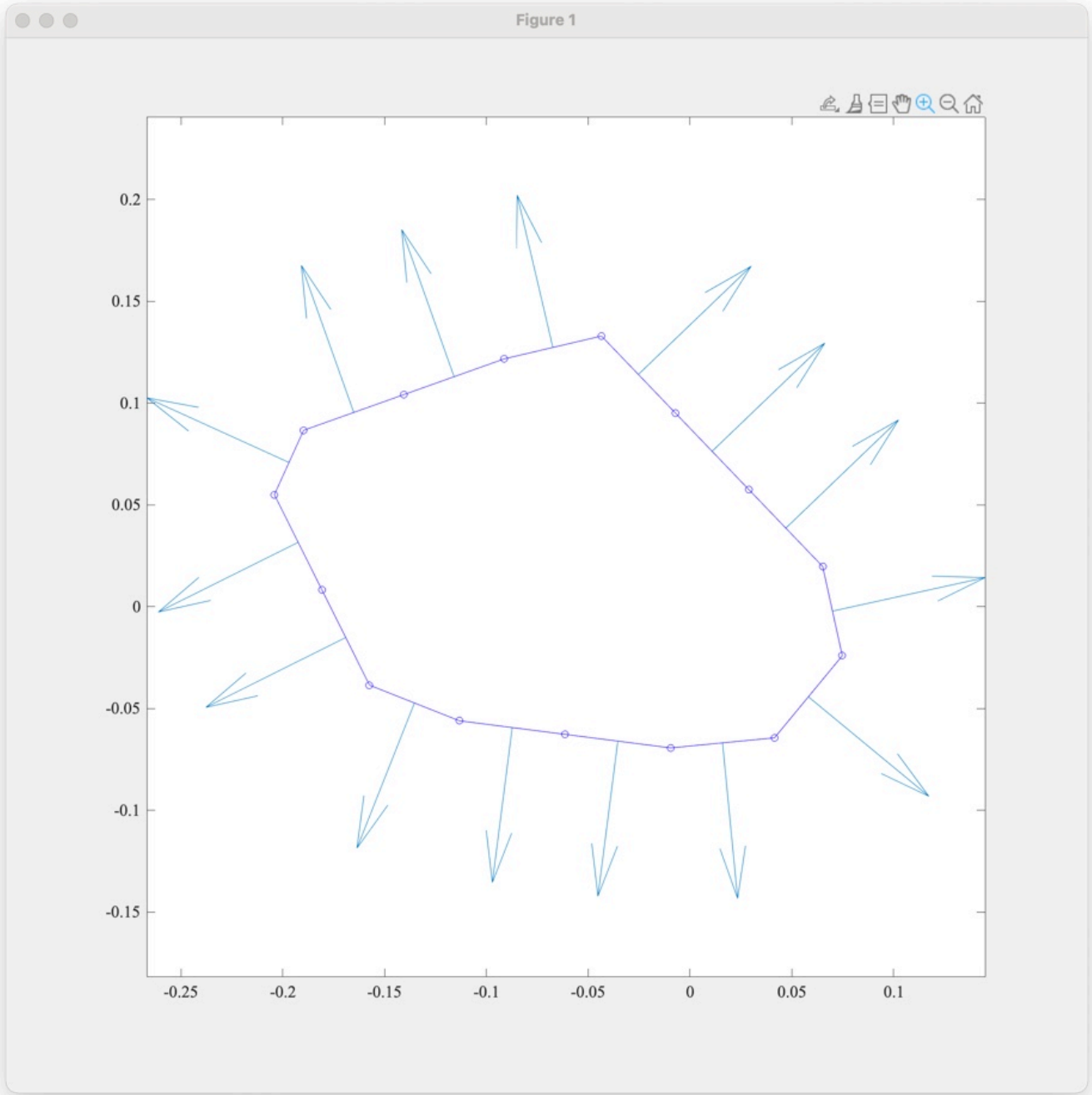
Building ousiograms (2021/01/31):



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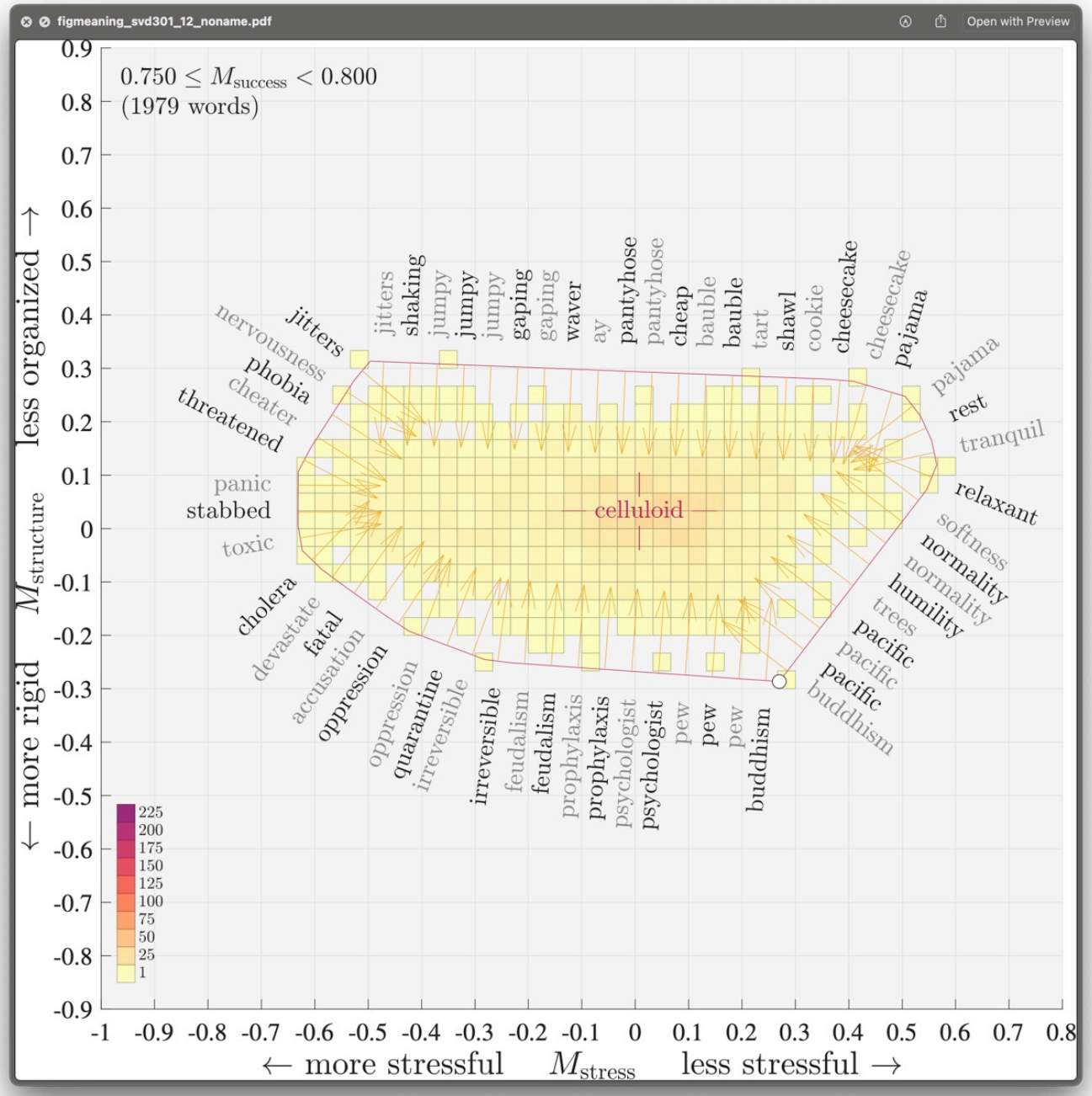

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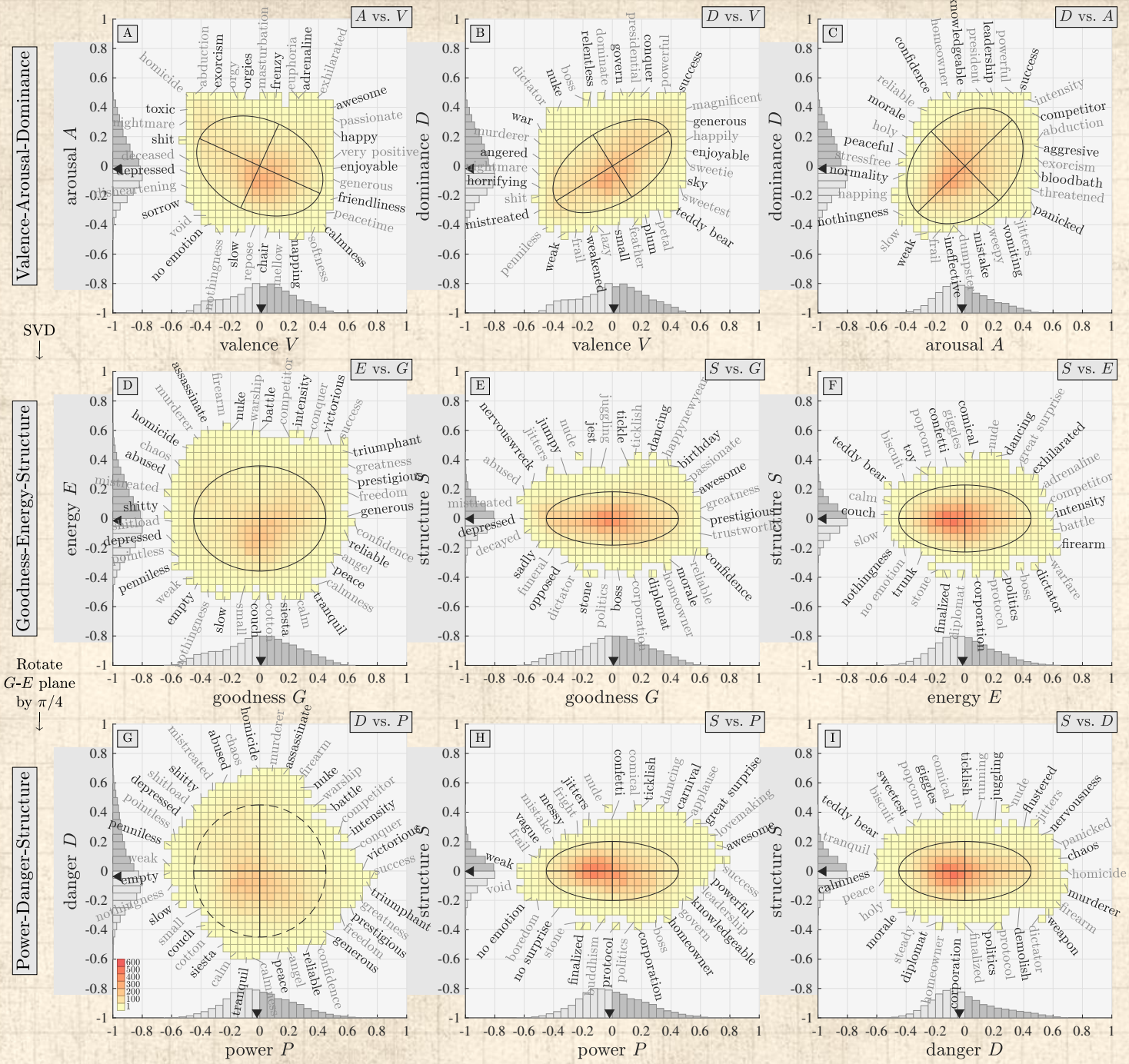
Ousiograms for the NRC VAD lexicon in the VAD, GES, and PDS frameworks:



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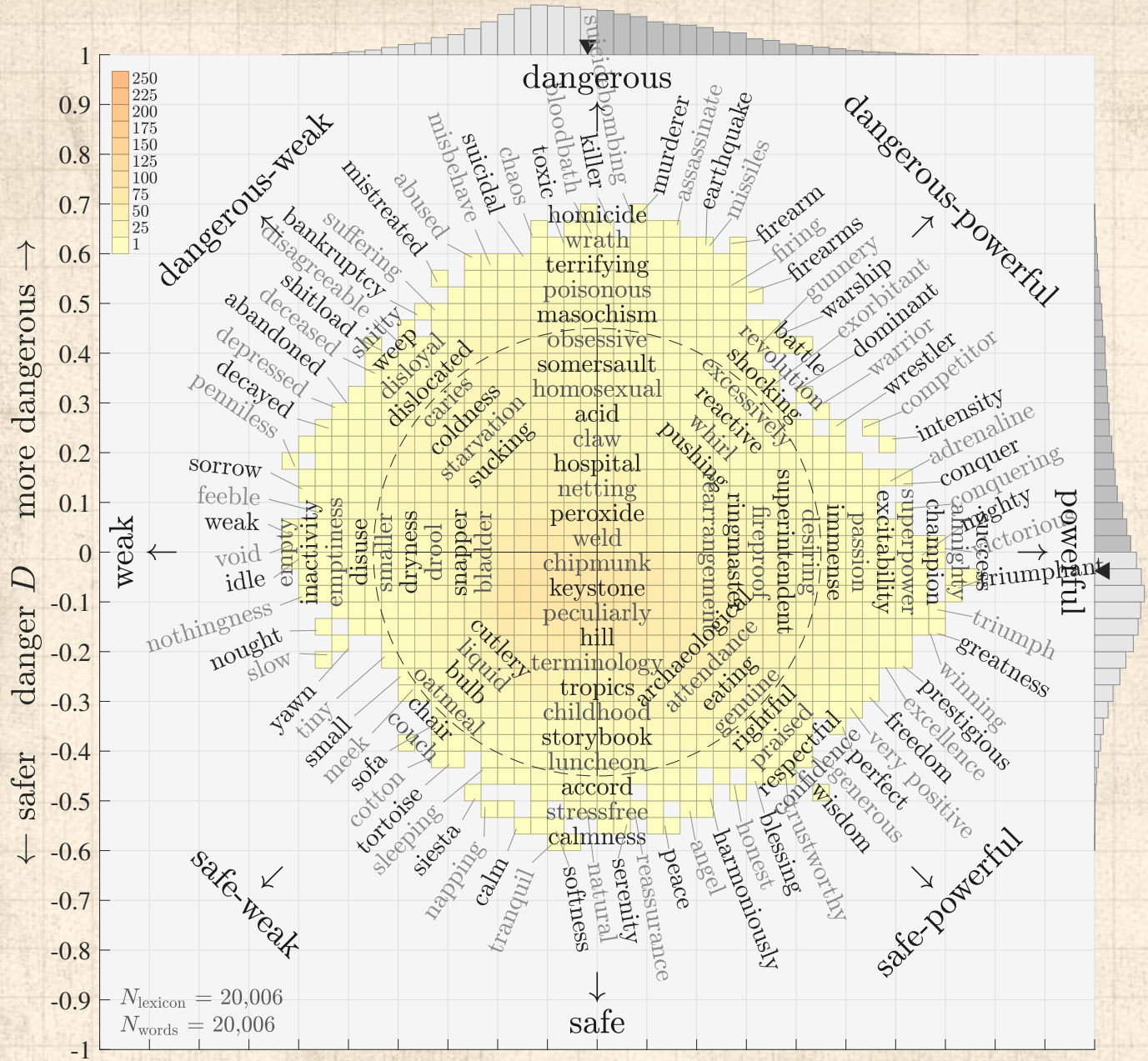

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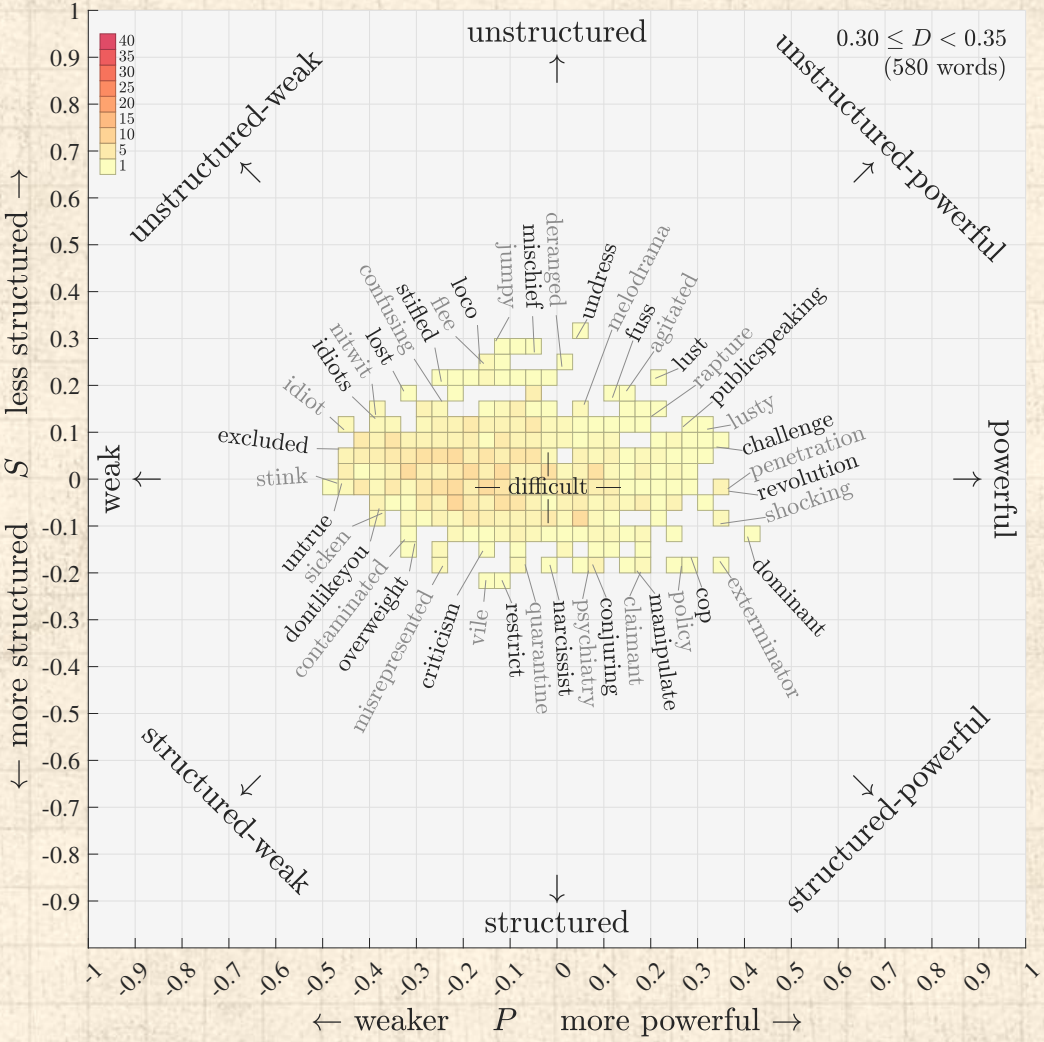
Ousiometric slices:



Slices of Structure Flipbook

Slices of Danger Flipbook

Slices of Power Flipbook

Extremonyms: Synousionyms and Antousionyms:

Powerful-Safe (Good) to Weak-Dangerous (Bad) axis:

Synousionyms	Valence	Arousal	Dominance	Goodness	Energy	Structure	Power	Danger	Structure
Anchor: wisdom	0.430	-0.198	0.371	0.579	-0.031	-0.158	0.388	-0.432	-0.158
education	0.396	-0.225	0.340	0.539	-0.065	-0.167	0.336	-0.427	-0.167
healthy	0.438	-0.181	0.318	0.558	-0.047	-0.108	0.362	-0.428	-0.108
trustworthy	0.469	-0.185	0.324	0.589	-0.052	-0.100	0.379	-0.453	-0.100
reliable	0.412	-0.259	0.375	0.575	-0.076	-0.202	0.353	-0.460	-0.202
Antousionyms	Valence	Arousal	Dominance	Goodness	Energy	Structure	Power	Danger	Structure
bullshit	-0.458	0.176	-0.317	-0.575	0.046	0.095	-0.373	0.439	0.095
shitty	-0.480	0.179	-0.337	-0.604	0.042	0.100	-0.397	0.456	0.100
nauseate	-0.438	0.160	-0.324	-0.558	0.026	0.101	-0.376	0.413	0.101
weeping	-0.418	0.188	-0.332	-0.549	0.042	0.131	-0.359	0.418	0.131
shame	-0.440	0.170	-0.345	-0.572	0.023	0.120	-0.388	0.421	0.120
diarrhea	-0.408	0.184	-0.357	-0.552	0.023	0.151	-0.374	0.407	0.151

Powerful to Weak axis:

Synousionyms	Valence	Arousal	Dominance	Goodness	Energy	Structure	Power	Danger	Structure
Anchor: success	0.459	0.380	0.481	0.571	0.501	0.095	0.758	-0.050	0.095
almighty	0.438	0.374	0.458	0.543	0.487	0.098	0.728	-0.040	0.098
triumphant	0.449	0.337	0.472	0.565	0.462	0.073	0.726	-0.072	0.073
champion	0.390	0.380	0.445	0.494	0.492	0.087	0.698	-0.001	0.087
victorious	0.384	0.386	0.446	0.489	0.499	0.087	0.698	0.007	0.087
Antousionyms	Valence	Arousal	Dominance	Goodness	Energy	Structure	Power	Danger	Structure
sorrow	-0.448	-0.265	-0.336	-0.509	-0.329	-0.127	-0.593	0.127	-0.127
tasteless	-0.354	-0.304	-0.352	-0.430	-0.385	-0.092	-0.576	0.032	-0.092
idle	-0.321	-0.333	-0.388	-0.414	-0.434	-0.068	-0.600	-0.014	-0.068
empty	-0.312	-0.317	-0.419	-0.424	-0.439	-0.033	-0.610	-0.011	-0.033
void	-0.365	-0.337	-0.370	-0.443	-0.420	-0.103	-0.611	0.016	-0.103

Extremonyms: Synousionyms and Antousionyms:

Dangerous-Powerful (High Energy) to Safe-Weak (Low Energy) axis:

Synousionyms	Valence	Arousal	Dominance	Goodness	Energy	Structure	Power	Danger	Structure
Anchor: volcanic	-0.156	0.410	0.281	-0.061	0.515	-0.045	0.322	0.407	-0.045
shelling	-0.163	0.417	0.273	-0.072	0.518	-0.039	0.316	0.417	-0.039
artillery	-0.150	0.412	0.294	-0.050	0.523	-0.050	0.335	0.405	-0.050
wild	-0.188	0.422	0.250	-0.105	0.514	-0.032	0.289	0.438	-0.032
rifles	-0.163	0.364	0.265	-0.068	0.470	-0.062	0.284	0.380	-0.062
Antousionyms	Valence	Arousal	Dominance	Goodness	Energy	Structure	Power	Danger	Structure
couch	0.094	-0.418	-0.302	-0.002	-0.524	0.025	-0.372	-0.369	0.025
mellow	0.133	-0.431	-0.235	0.066	-0.504	-0.009	-0.310	-0.403	-0.009
pillow	0.163	-0.372	-0.305	0.049	-0.498	0.085	-0.317	-0.387	0.085
tortoise	0.173	-0.422	-0.250	0.092	-0.511	0.025	-0.297	-0.427	0.025
quilt	0.143	-0.377	-0.274	0.048	-0.482	0.052	-0.307	-0.375	0.052
cotton	0.139	-0.429	-0.260	0.059	-0.517	0.012	-0.324	-0.407	0.012

Dangerous to Safe axis:

Synousionyms	Valence	Arousal	Dominance	Goodness	Energy	Structure	Power	Danger	Structure
Anchor: homicide	-0.490	0.473	0.018	-0.485	0.478	0.011	-0.005	0.681	0.011
killer	-0.459	0.471	0.043	-0.446	0.485	0.008	0.028	0.658	0.008
psychopath	-0.460	0.443	0.036	-0.446	0.458	-0.003	0.009	0.640	-0.003
bloodshed	-0.452	0.442	0.025	-0.444	0.450	0.008	0.004	0.633	0.008
violate	-0.439	0.470	0.019	-0.440	0.468	0.033	0.020	0.642	0.033
Antousionyms	Valence	Arousal	Dominance	Goodness	Energy	Structure	Power	Danger	Structure
natural	0.354	-0.382	-0.019	0.354	-0.382	-0.026	-0.020	-0.520	-0.026
tranquil	0.417	-0.406	-0.145	0.351	-0.480	0.078	-0.091	-0.588	0.078
softness	0.375	-0.414	-0.098	0.338	-0.455	0.021	-0.082	-0.561	0.021
serenity	0.400	-0.378	0.057	0.429	-0.345	-0.054	0.060	-0.547	-0.054
comfortable	0.427	-0.337	-0.027	0.406	-0.361	0.039	0.032	-0.542	0.039
calmness	0.434	-0.395	-0.106	0.383	-0.453	0.065	-0.049	-0.591	0.065

Etymological, taxonomic, and nomenclatural madnesses:

- Physics: Power was once sometimes called Activity
- Danger and Dominance trace back to Dominus (∼ lord/ruler/person of power)
- Framing words for EPA, VAD, etc., matter greatly.

Other descriptors that don't hold up:

- Success-Stress-Structure.
- Energy/Flourishing/Thriving-Threat
- Power-Order/Chaos-Gravity/Seriousness

After much staring at the ceiling:

- Goodness-Energy-Structure (GES) (still fails)
- Power-Danger-Structure (PDS) (succeeds)

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Connections between meaning dimensions:

$$\begin{bmatrix} \textbf{Goodness} \\ \textbf{Energy} \\ \textbf{Structure} \end{bmatrix} \simeq \begin{bmatrix} +0.86 & -0.15 & +0.48 \\ -0.16 & +0.83 & +0.54 \\ +0.48 & +0.55 & -0.69 \end{bmatrix} \begin{bmatrix} \textbf{Valence} \\ \textbf{Arousal} \\ \textbf{Dominance} \end{bmatrix}$$

$$\begin{bmatrix} \textbf{Power} \\ \textbf{Danger} \\ \textbf{Structure} \end{bmatrix} \simeq \begin{bmatrix} 0.53 & 0.45 & 0.72 \\ -0.70 & 0.71 & 0.07 \\ 0.48 & 0.55 & -0.69 \end{bmatrix} \begin{bmatrix} \textbf{Valence} \\ \textbf{Arousal} \\ \textbf{Dominance} \end{bmatrix}$$

$$\begin{bmatrix} \textbf{Power} \\ \textbf{Danger} \end{bmatrix} = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} \textbf{Goodness} \\ \textbf{Energy} \end{bmatrix} \quad (1)$$

From types to tokens: [7]

- Analysis so far is for a lexicon of types: Each word counts once.
- Must consider how words are used in real texts by frequency: Tokens.
- Rebuild ousiograms with usage frequency incorporated.
- A set of distinct corpora:
  - English fiction from Google Books (120 years). [10, 15]
  - Jane Austen's novels.
  - Sherlock Holmes stories.
  - New York Times (20 years). [19]
  - Wikipedia (2019/03). [20]
  - RadioTalk: Transcriptions of talk radio. [3]
  - Twitter through Storywrangler. [1]

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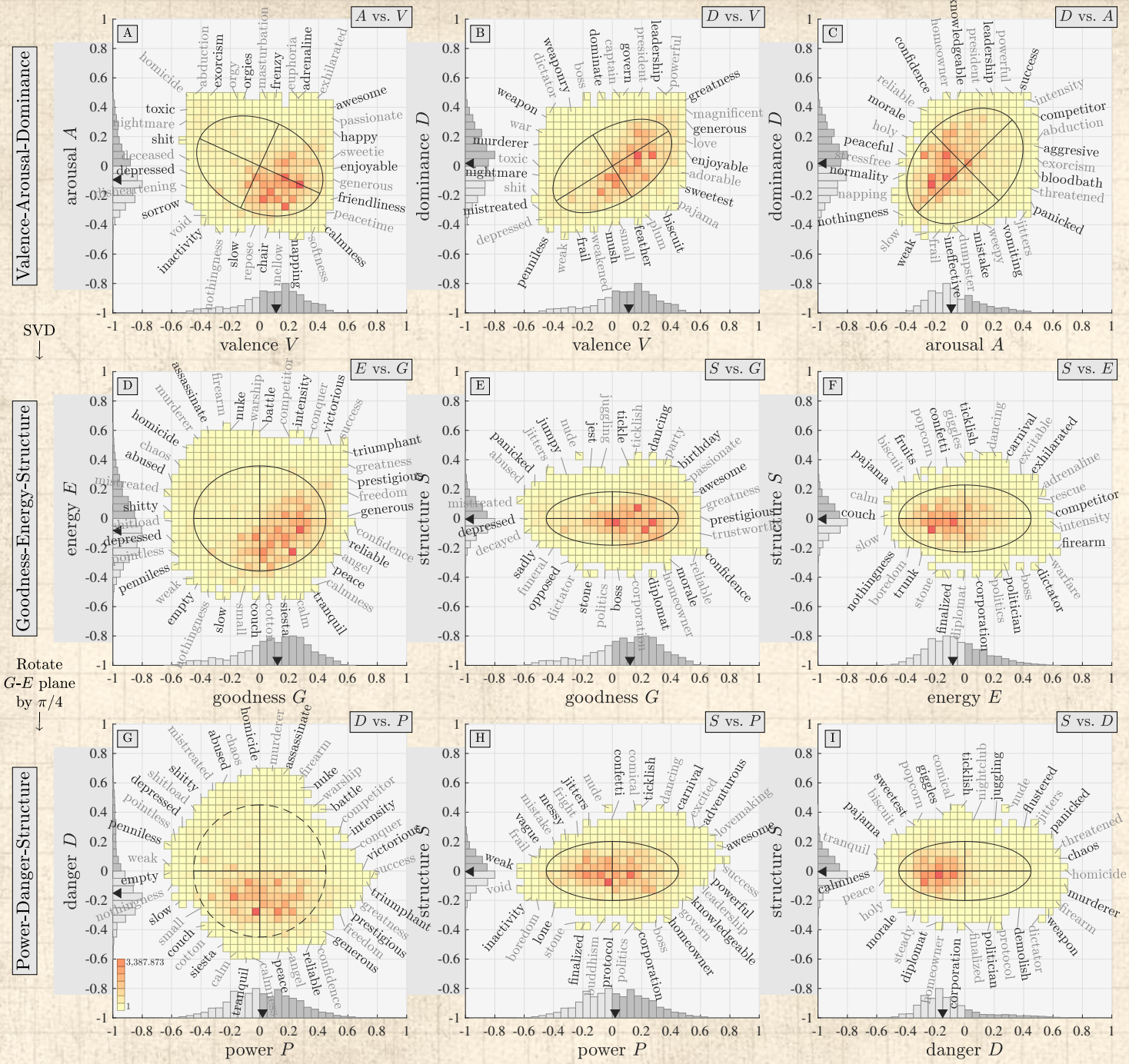
Ousiograms for English fiction in the VAD, GES, and PDS frameworks:



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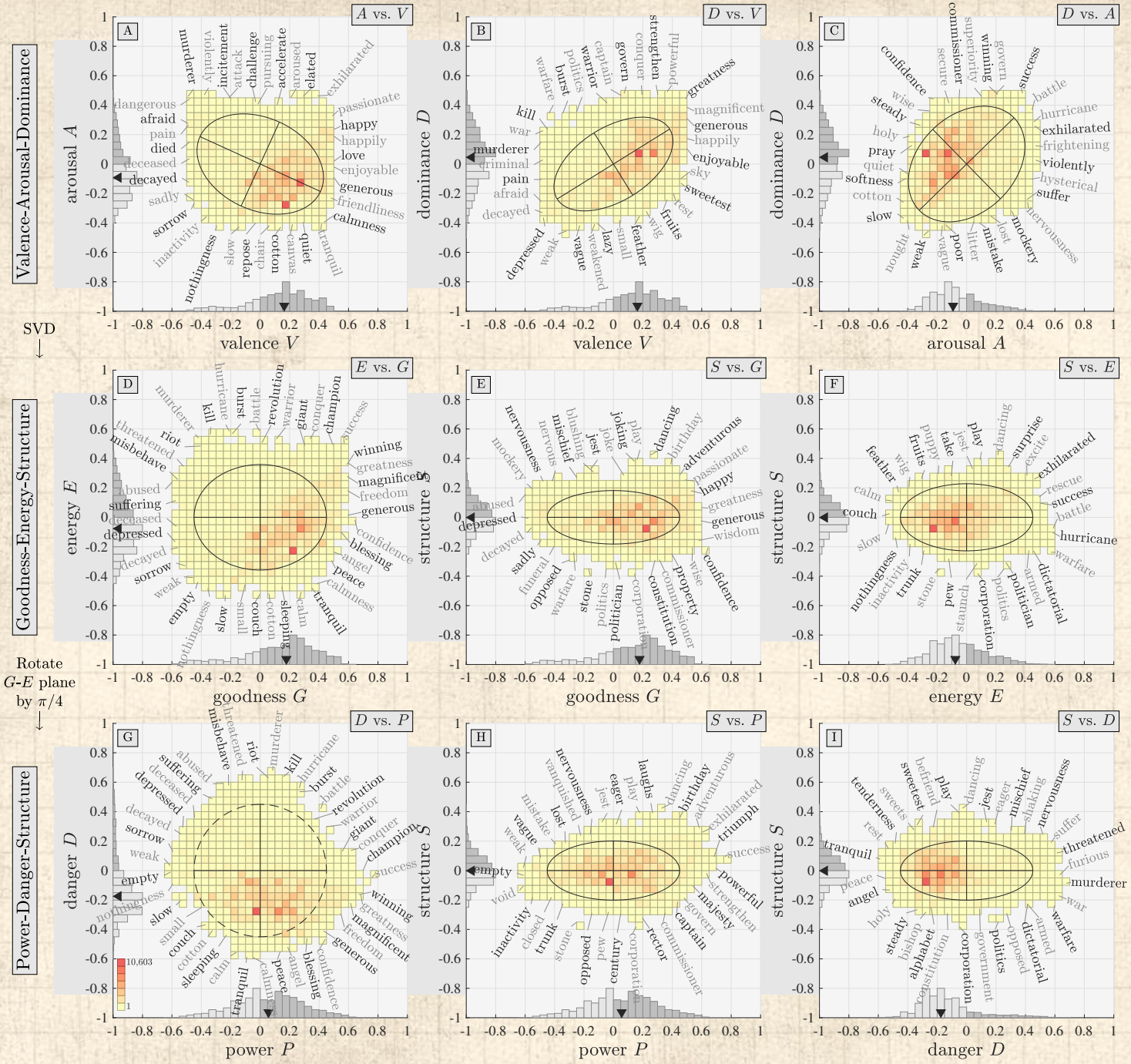
Ousiograms for Jane Austen's novels in the VAD, GES, and PDS frameworks:



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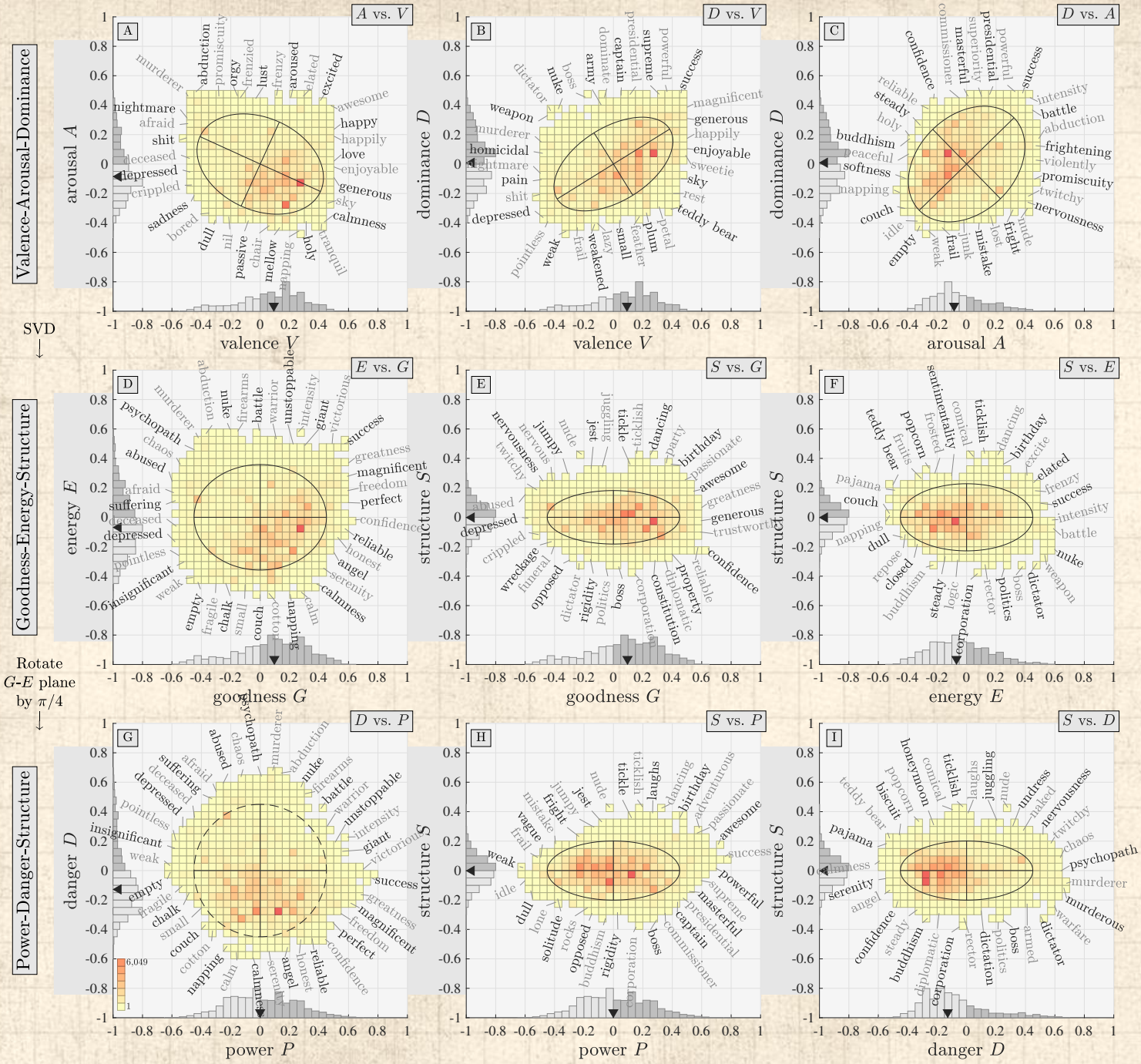
Ousiograms for Sherlock Holmes in the VAD, GES, and PDS frameworks:



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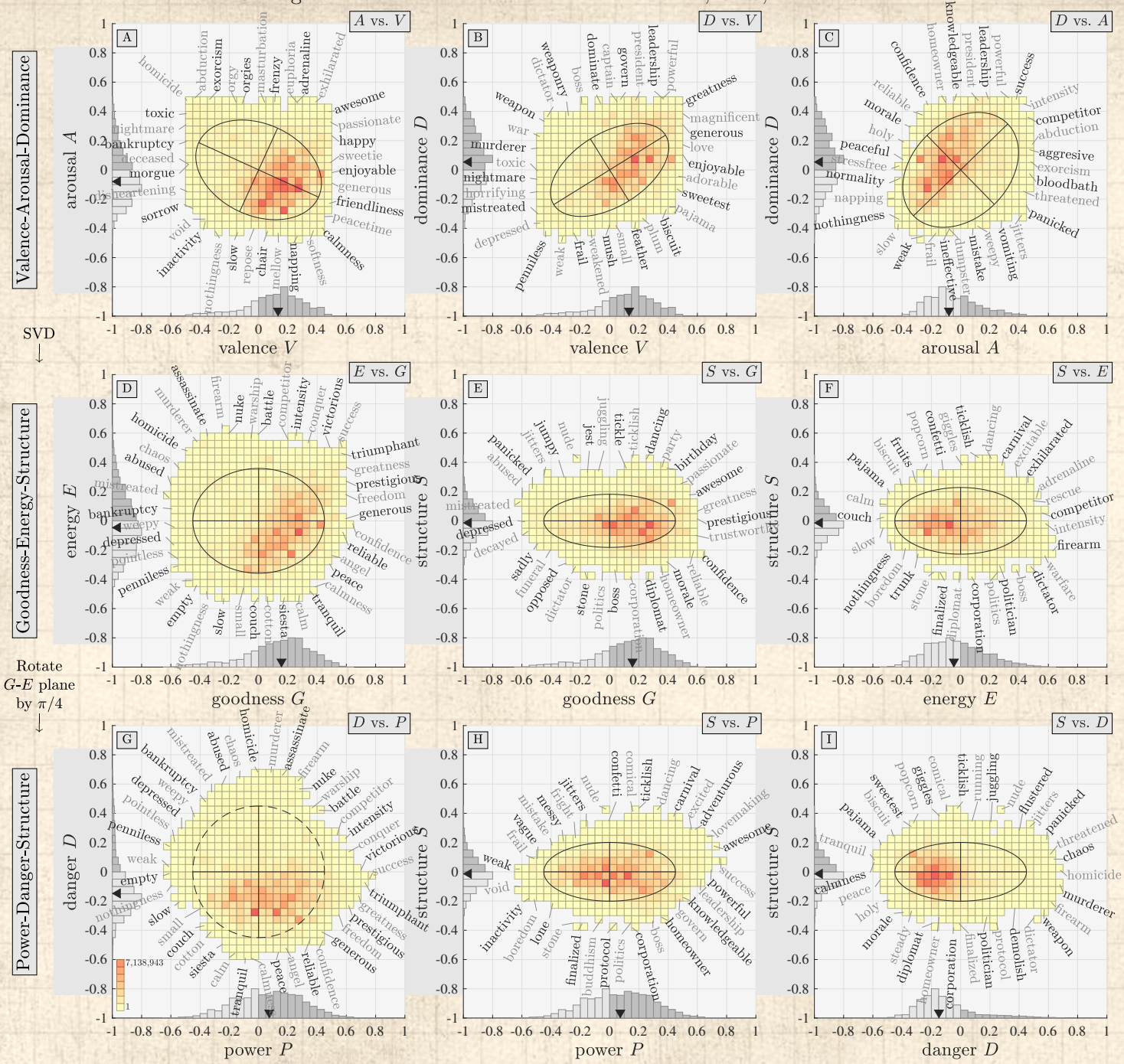

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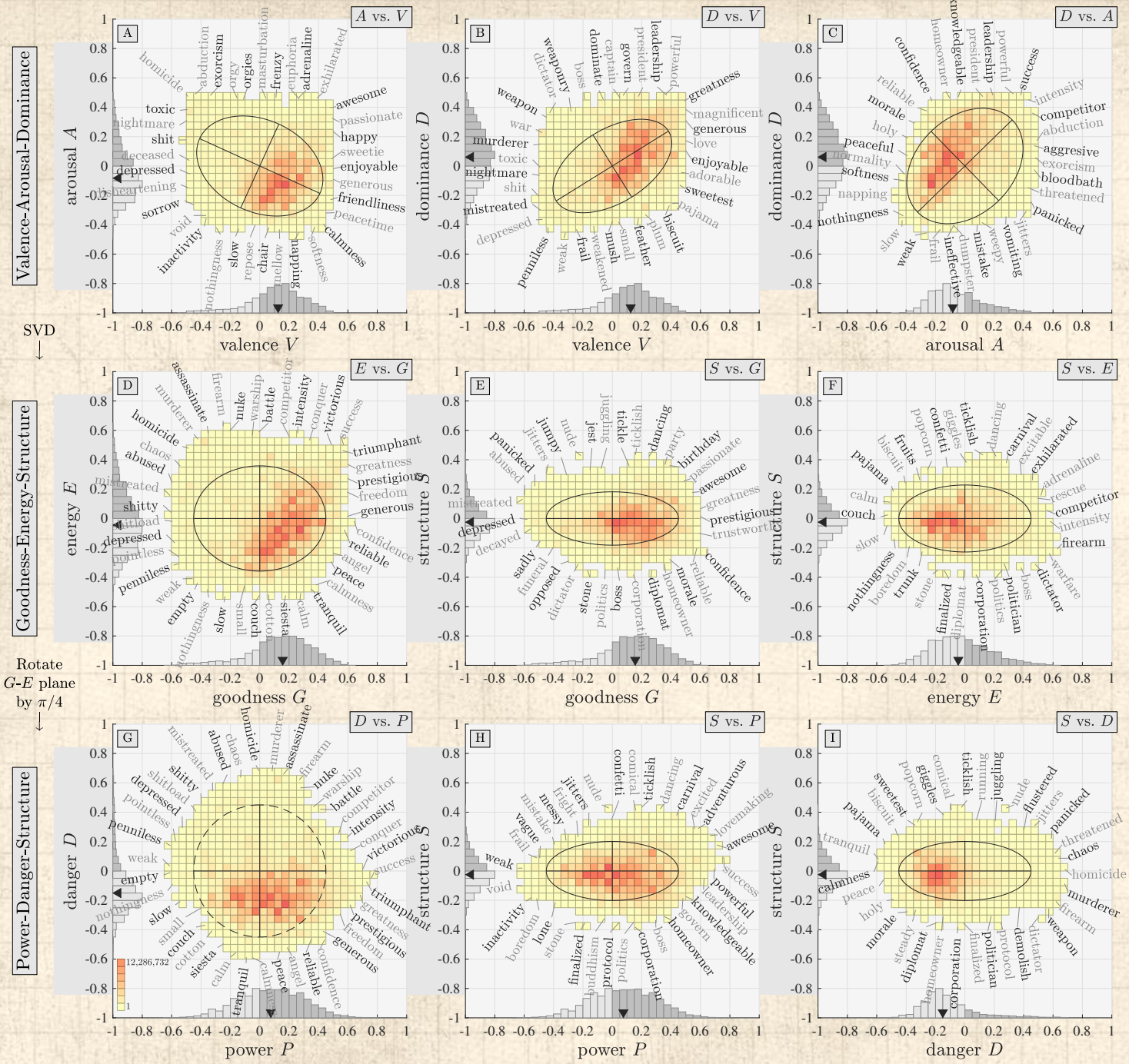
Ousiograms for Wikipedia in the VAD, GES, and PDS frameworks:



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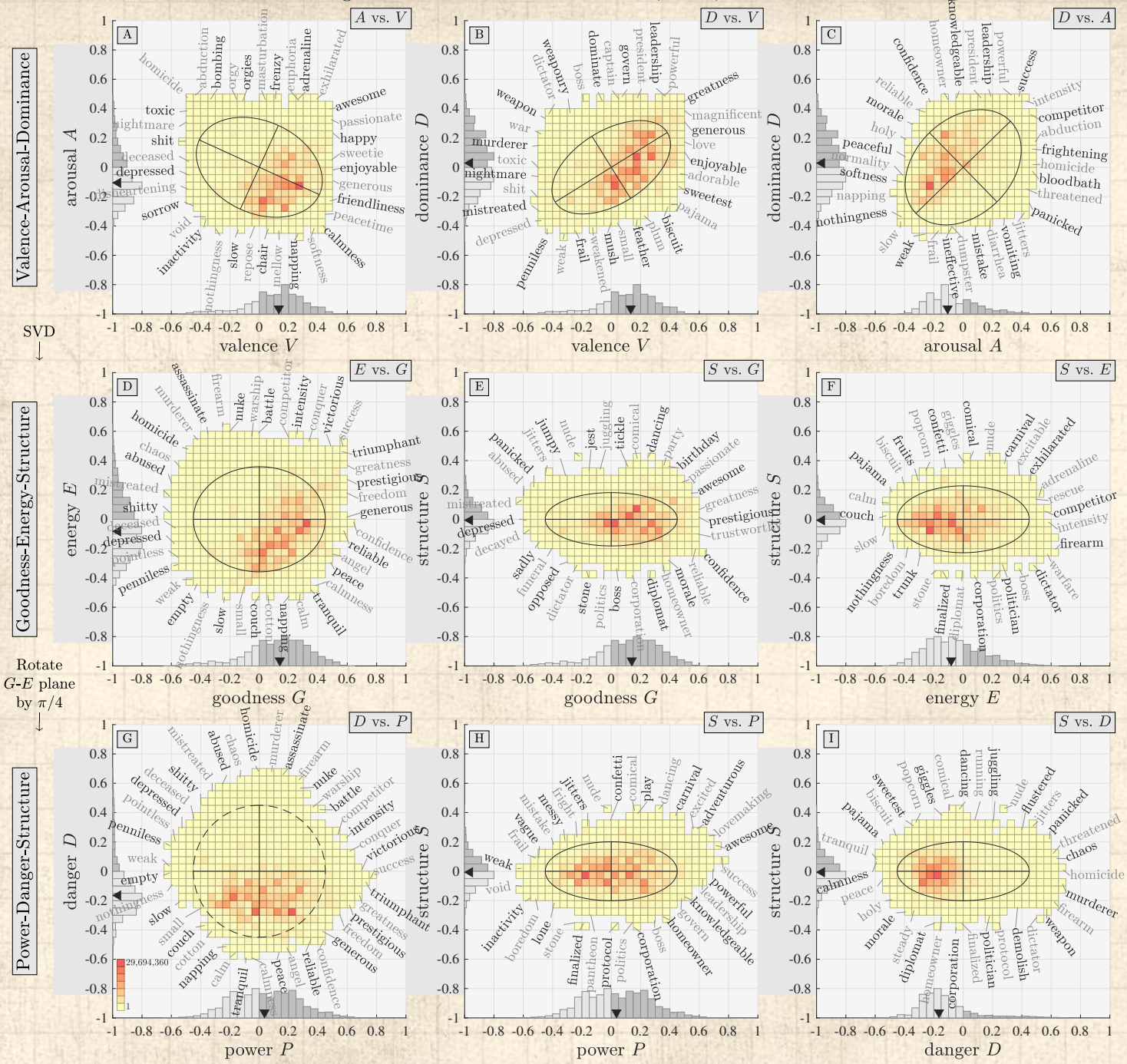

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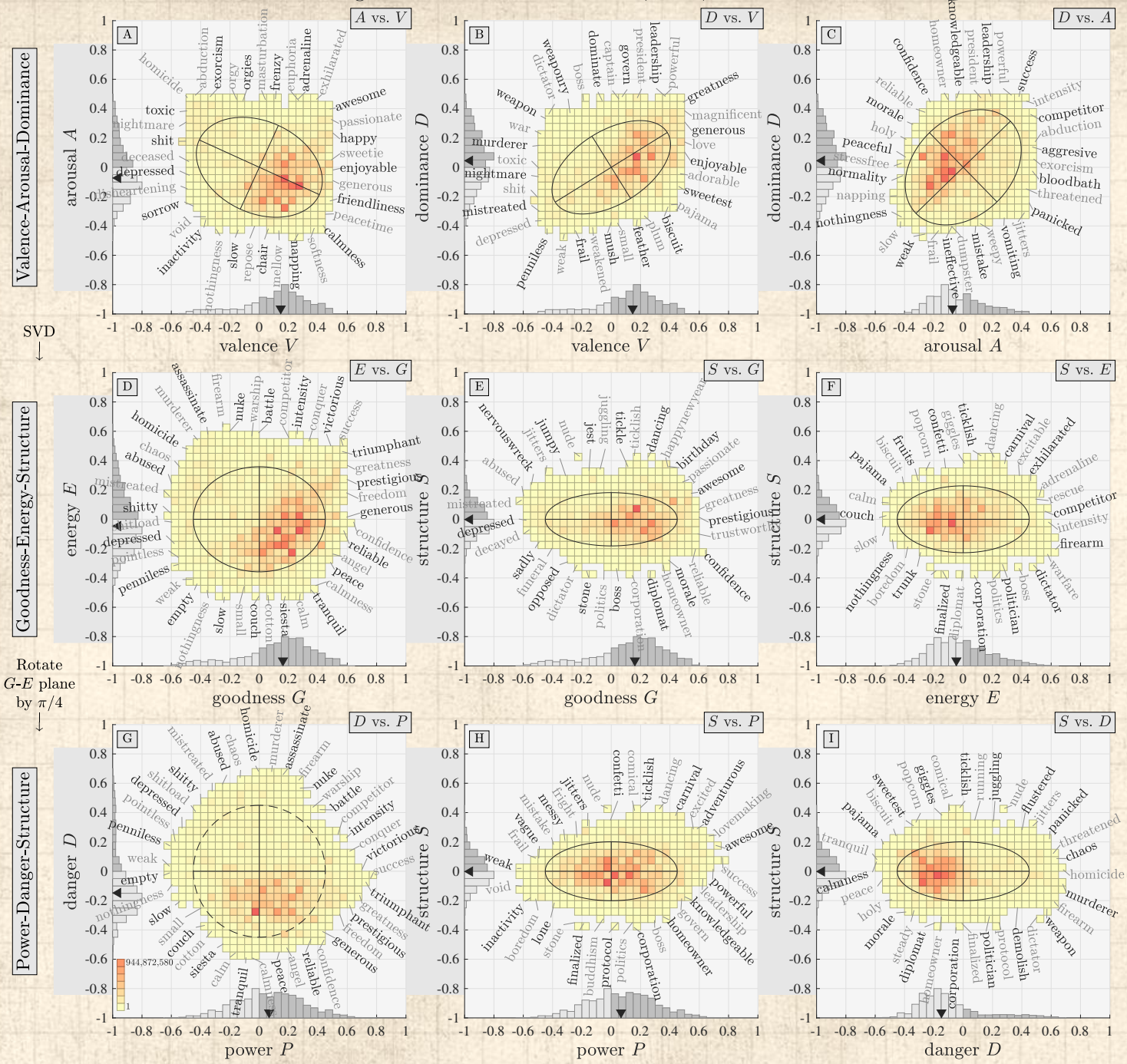

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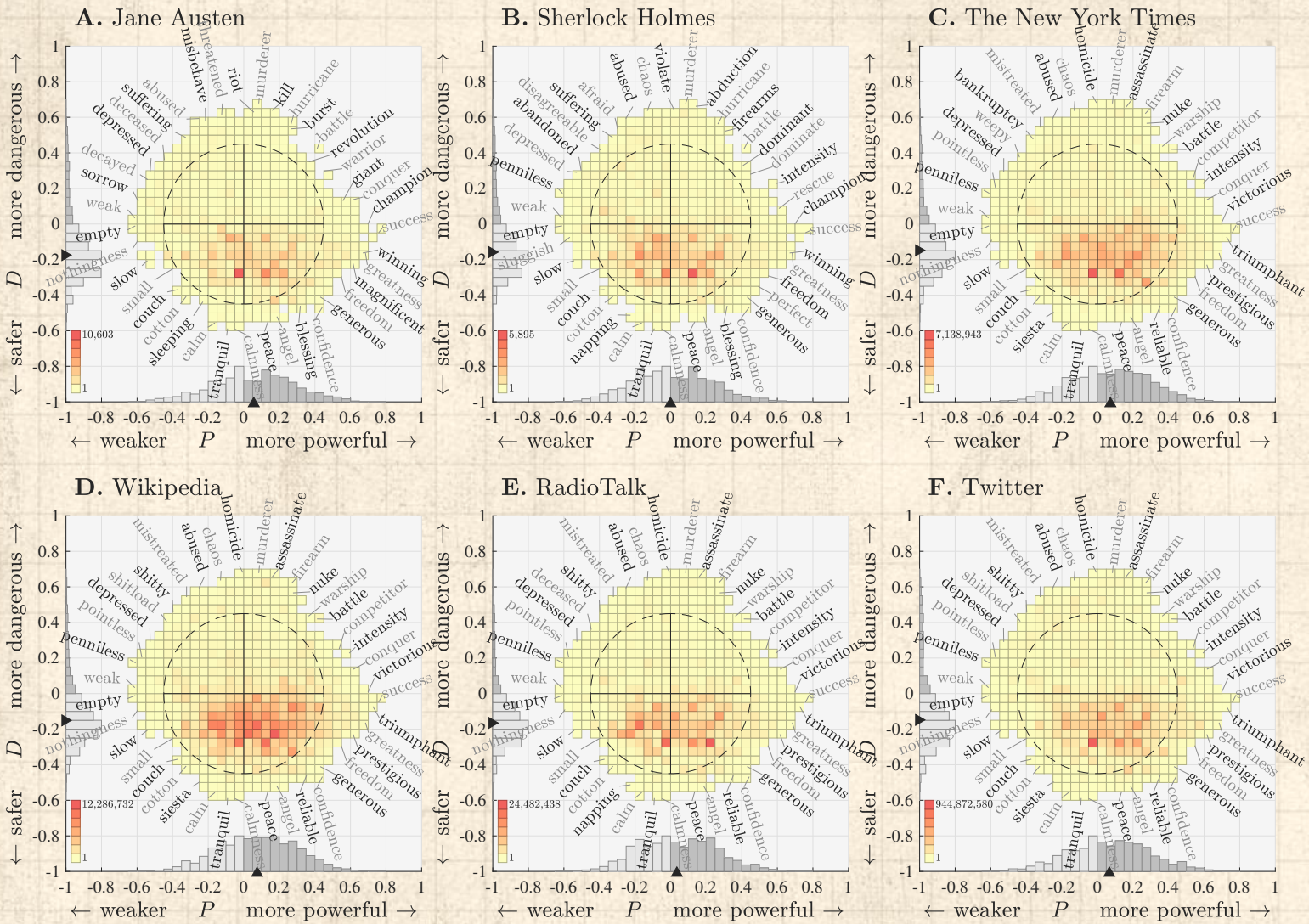

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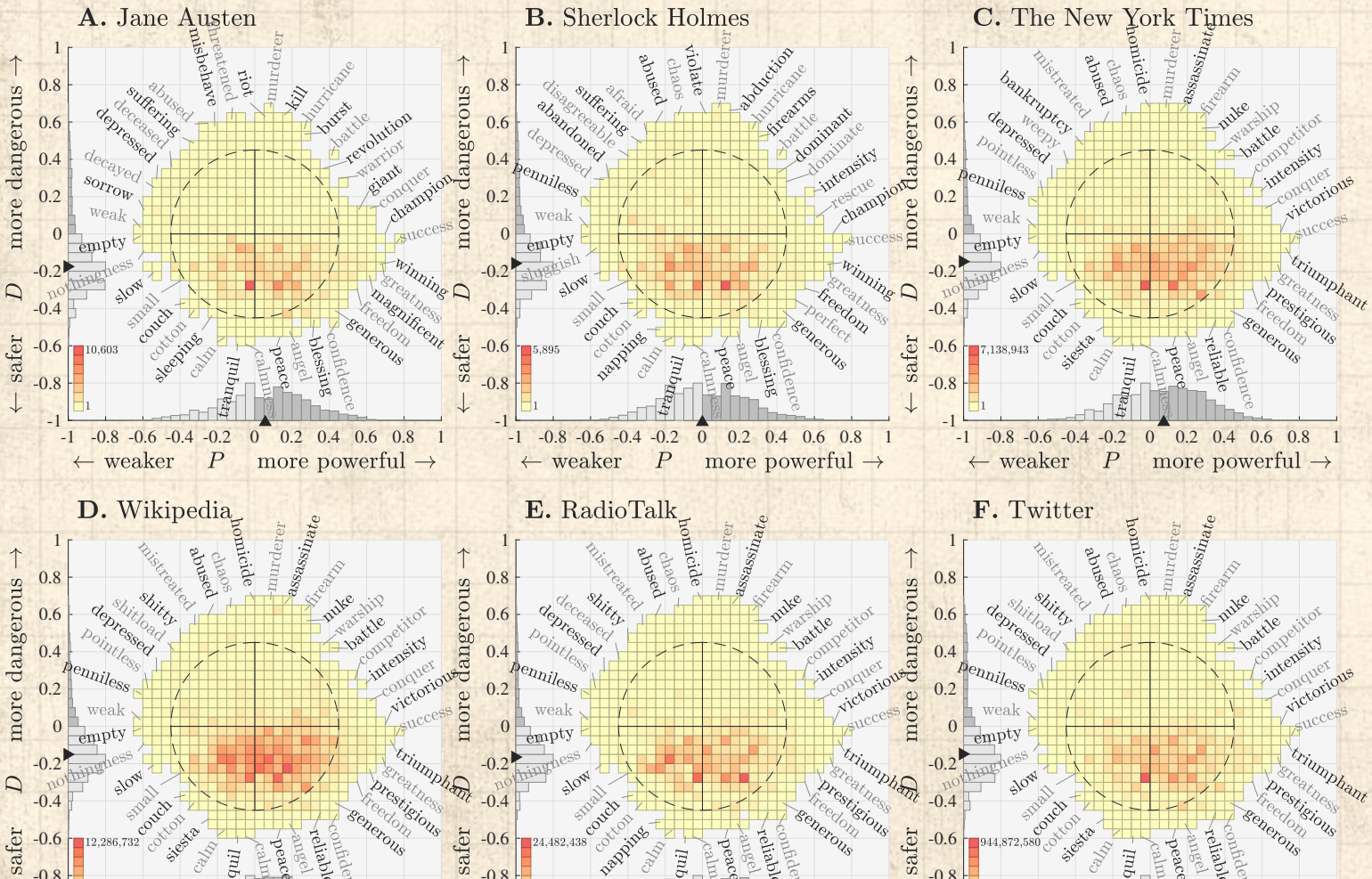
A special thing has happened:

- The PDS framework emerged only from analyzing a lexicon (types).
- Applying PDS framework to disparate corpora (tokens) reveals a linguistic ‘safety bias’.



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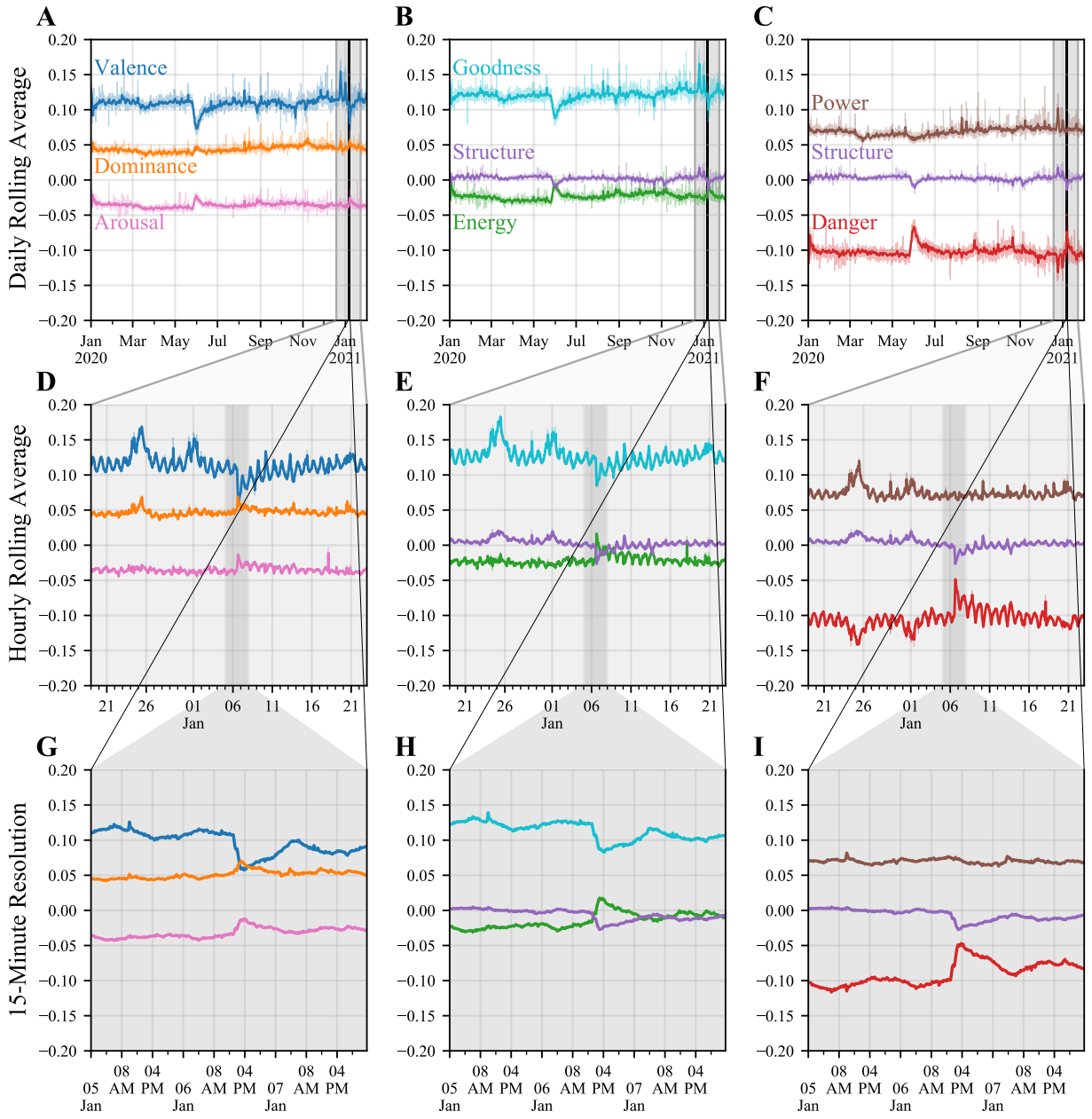
Prototype ousiometer—Twitter:



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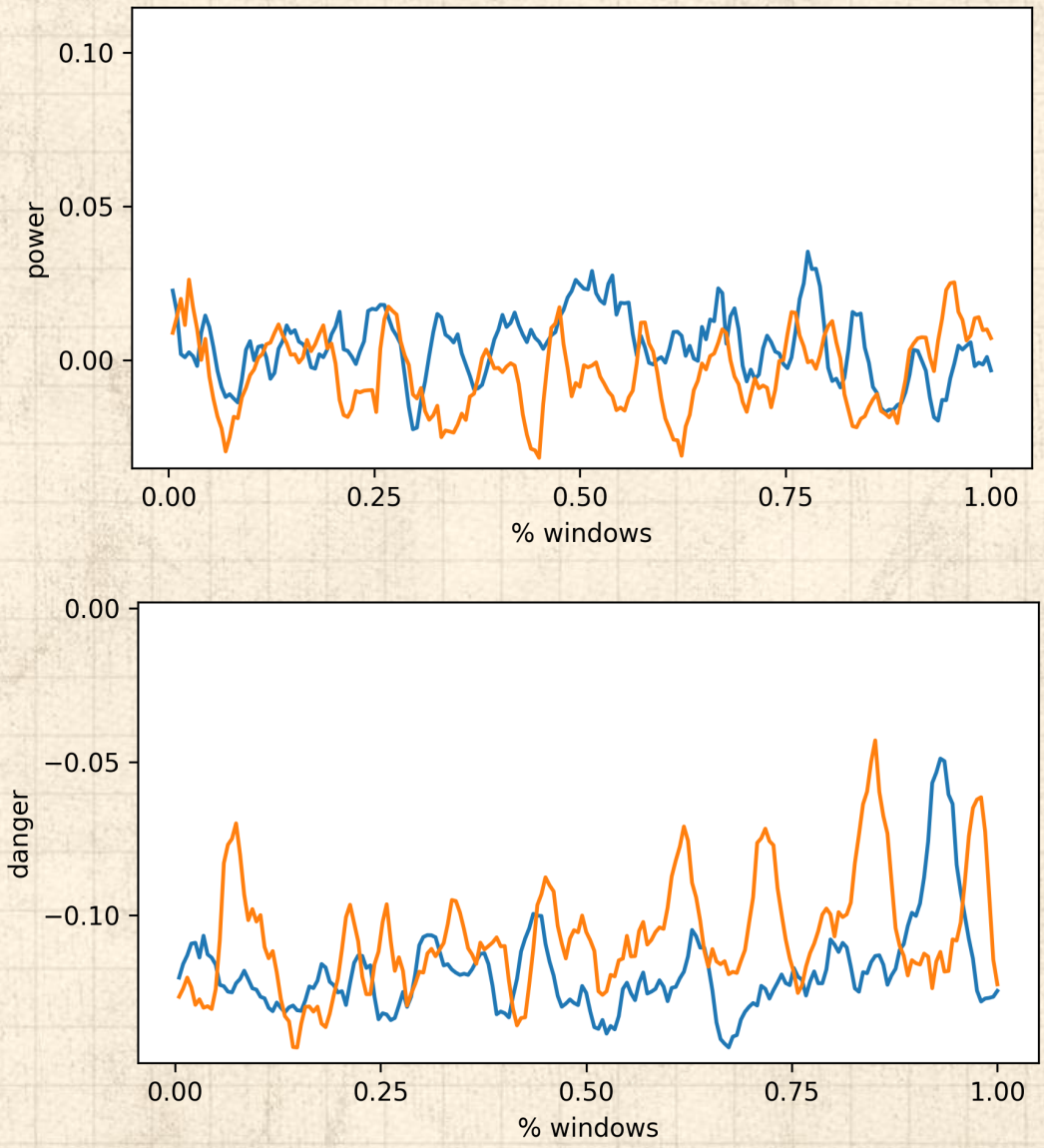
Prototype ousiometer—Harry Potter:



Blue: Harry Potter and the Half-Blood Prince
Orange: Harry Potter and the Deathly Hallows

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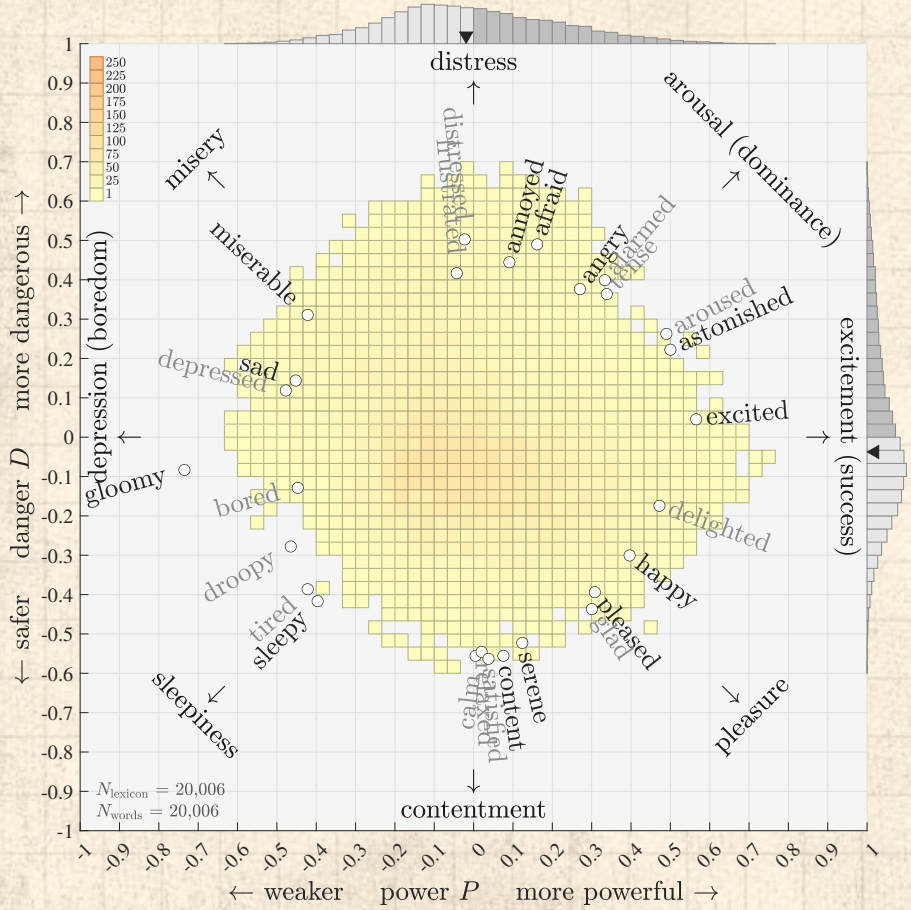
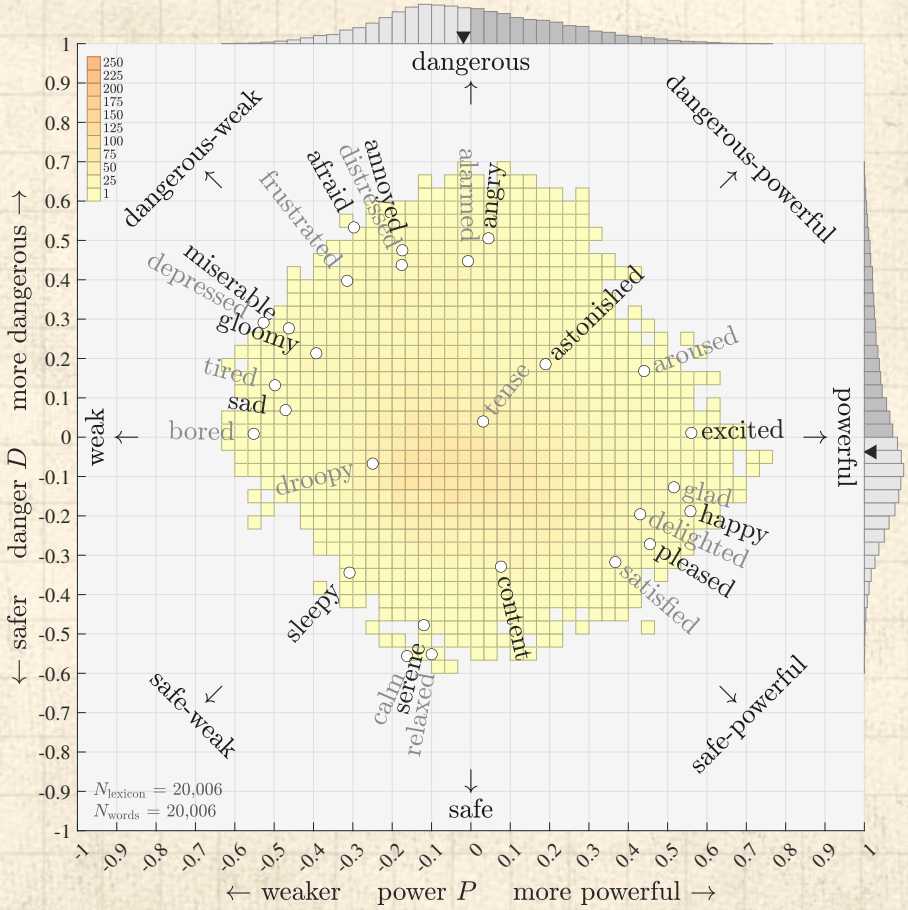
- Rough agreement with Russell's circumplex model, [18] which itself doesn't disagree with a 2-d orthogonal framework.

A. Circumplex model of affect:



B. Power-danger coordinates for Russell's affect words:



Dungeons & Dragons—Two alignment axes for character:

[1]

Law–Chaos (vertical) and Good–Evil (horizontal).

[1] From this Reddit thread, where, naturally, the choices are enthusiastically debated.

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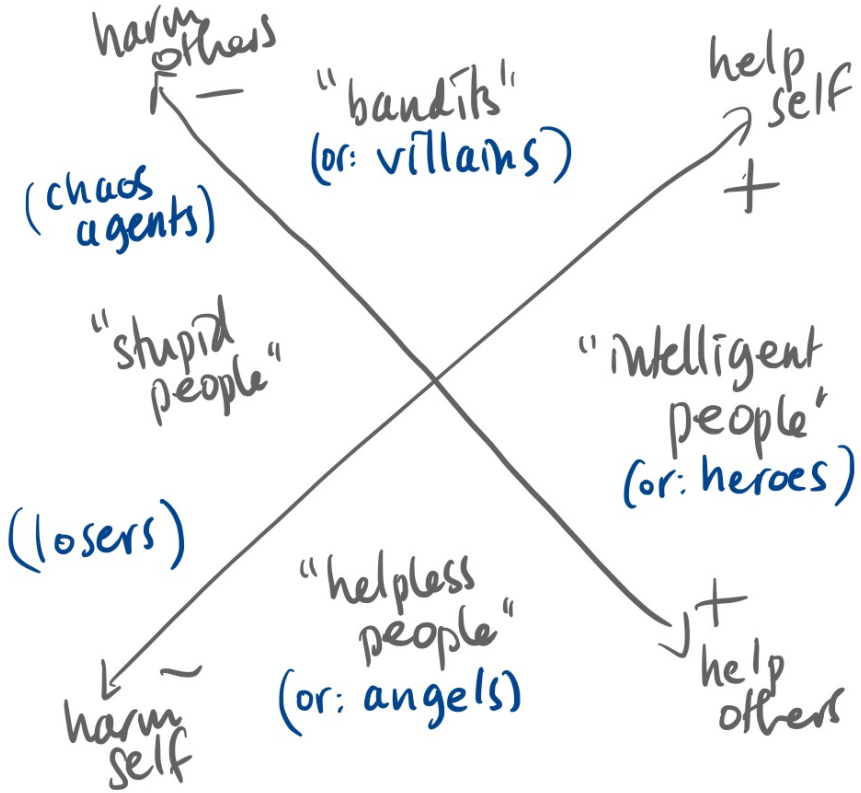
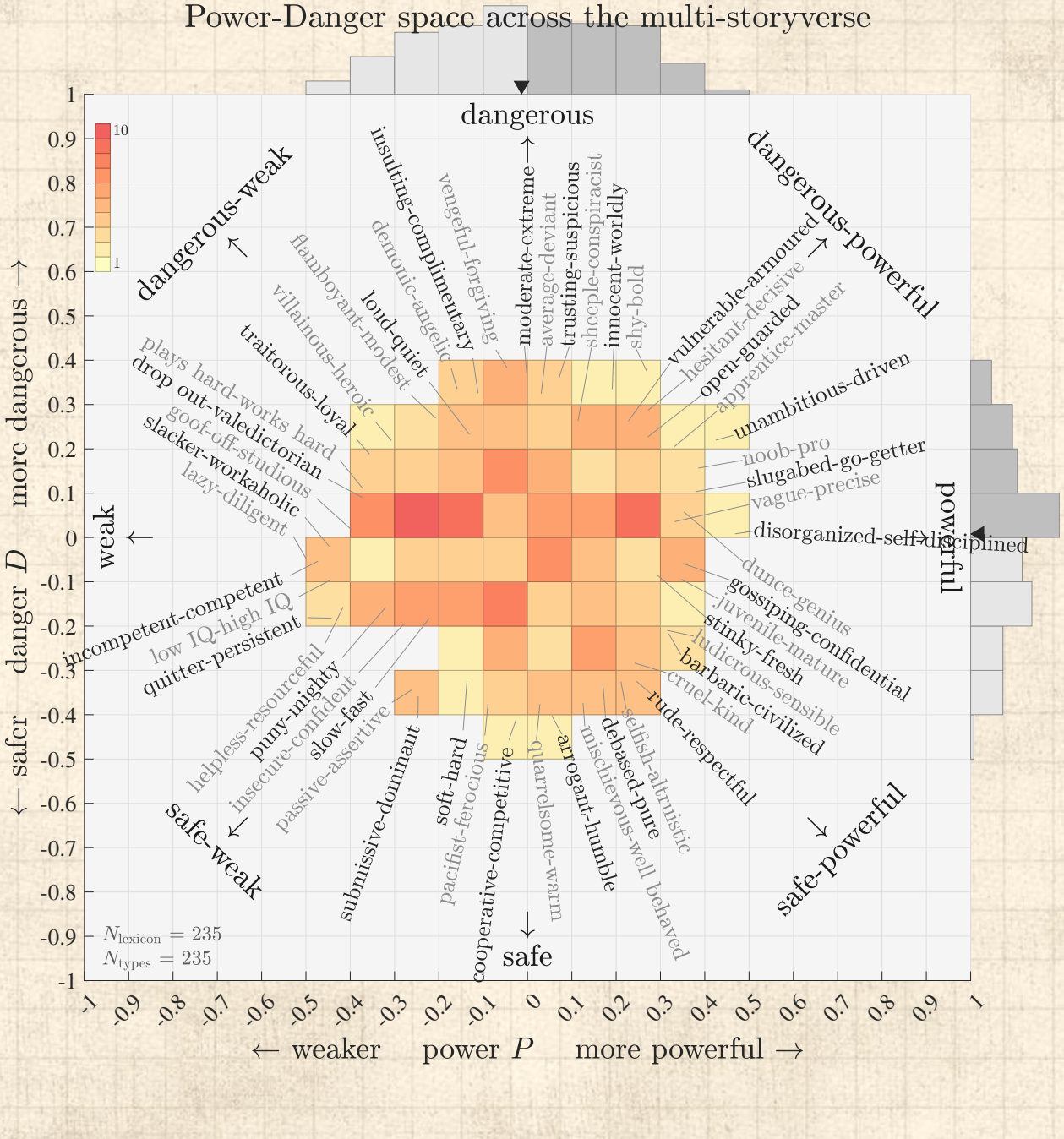
lawful-good ~ structured- powerful-safe	neutral-good ~ neutral- powerful-safe	chaotic-good ~ unstructured- powerful-safe
lawful-neutral ~ structured- neutral	(true) neutral	chaotic-neutral ~ unstructured- neutral
lawful-evil ~ structured- dangerous	neutral-evil ~ neutral- dangerous	chaotic-evil ~ unstructured- dangerous

Cipolla's Basic Law's of Human Stupidity:



800 characters, 200+ semantic differentials:



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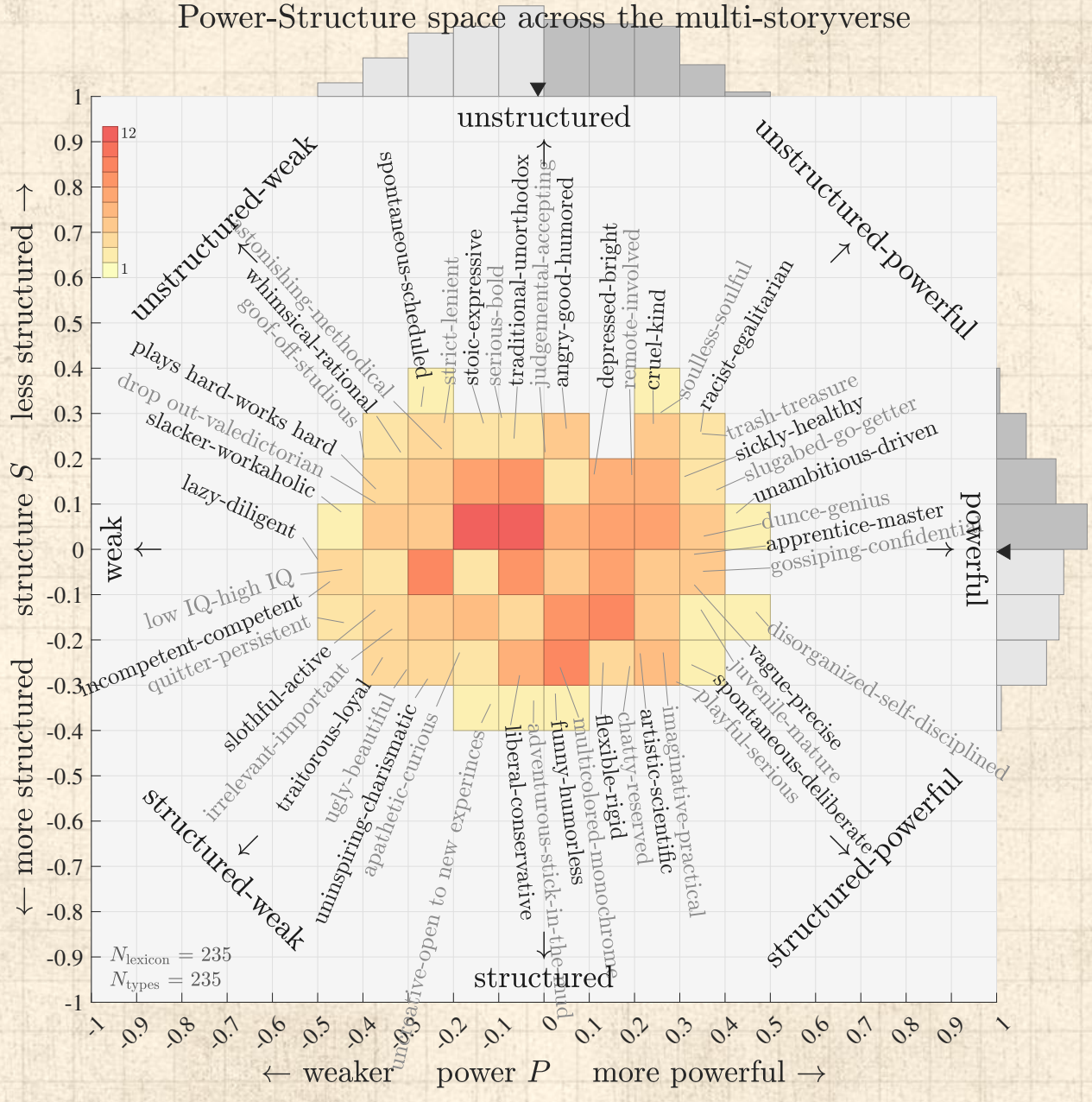

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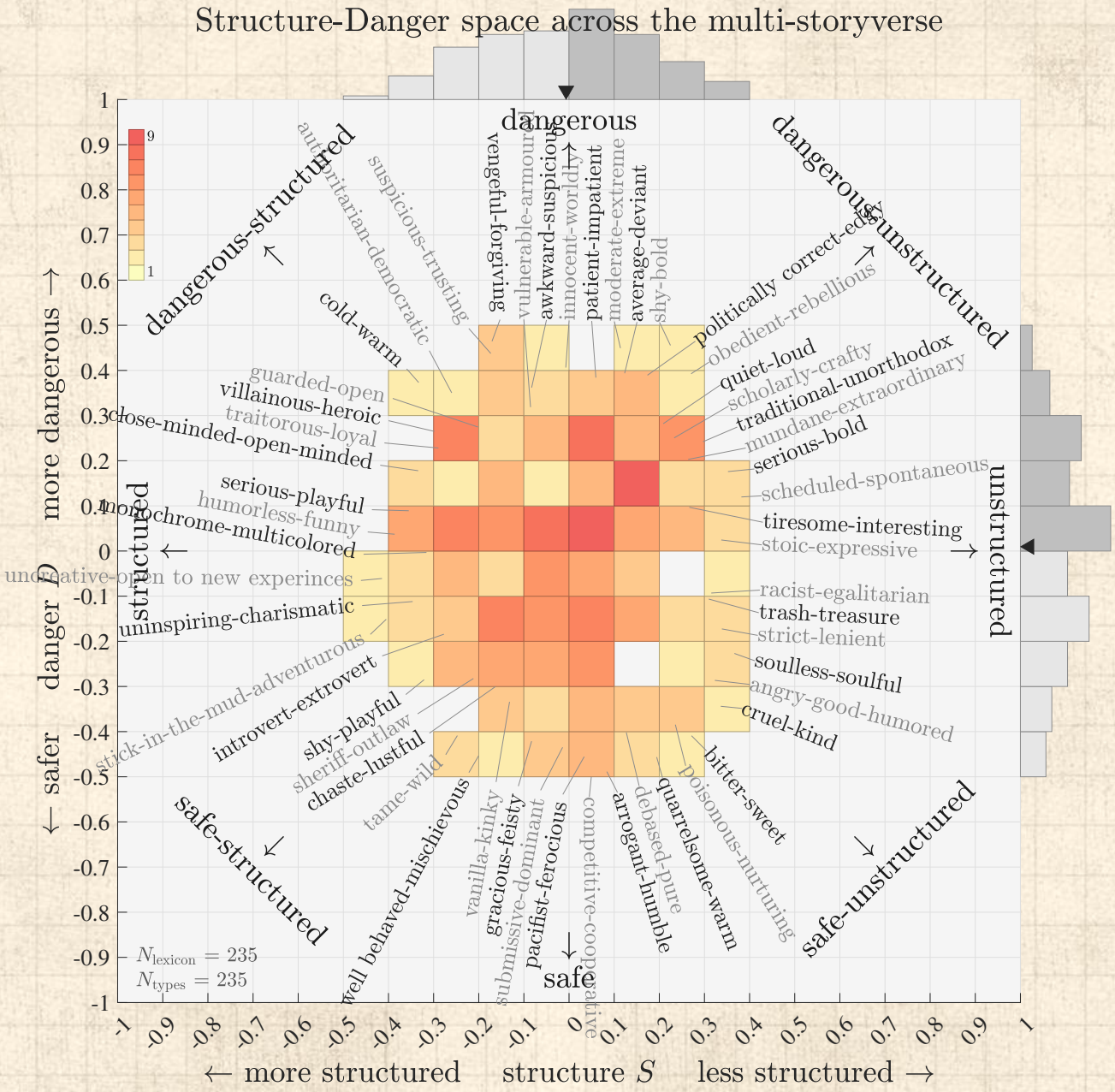

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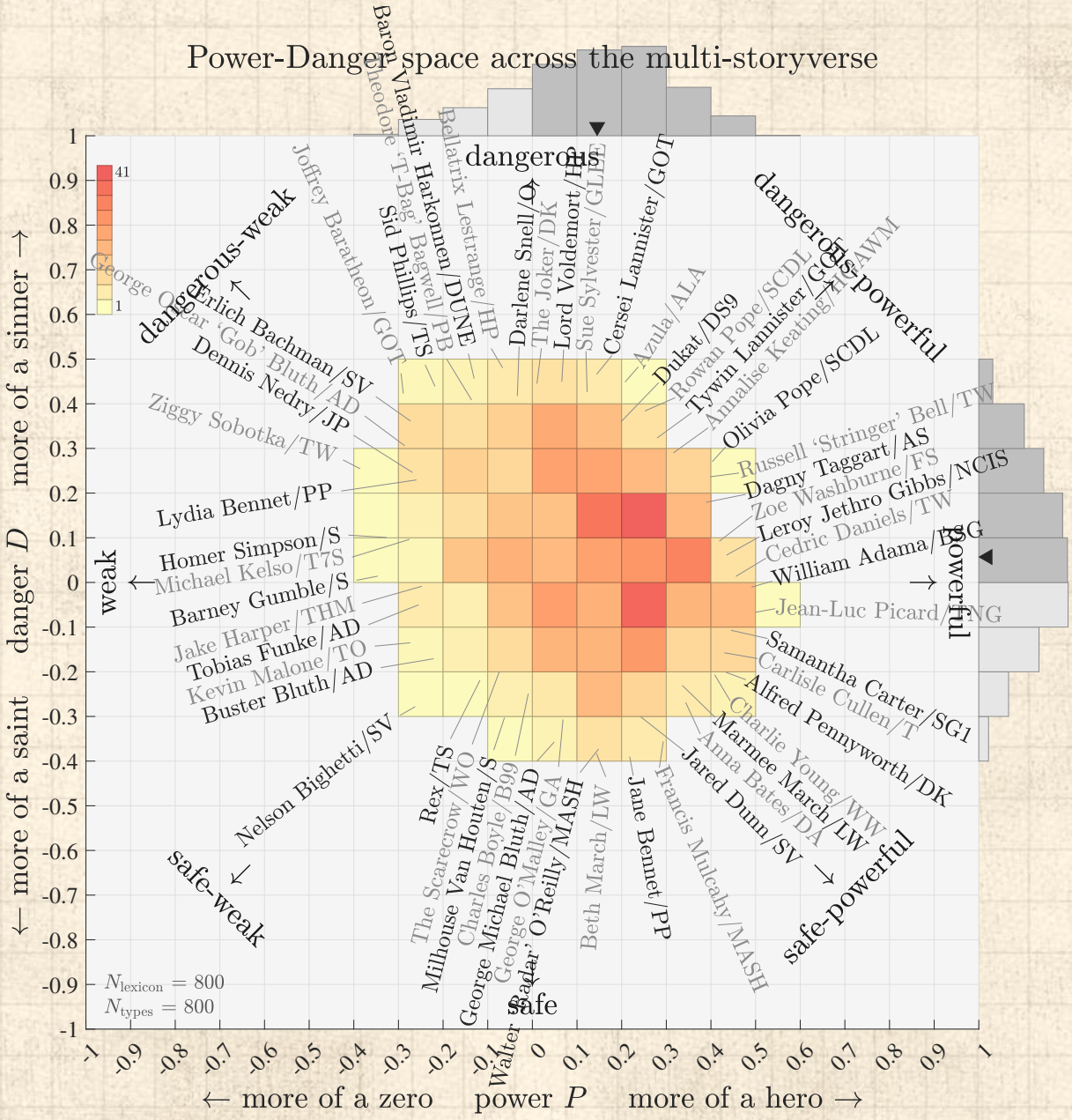

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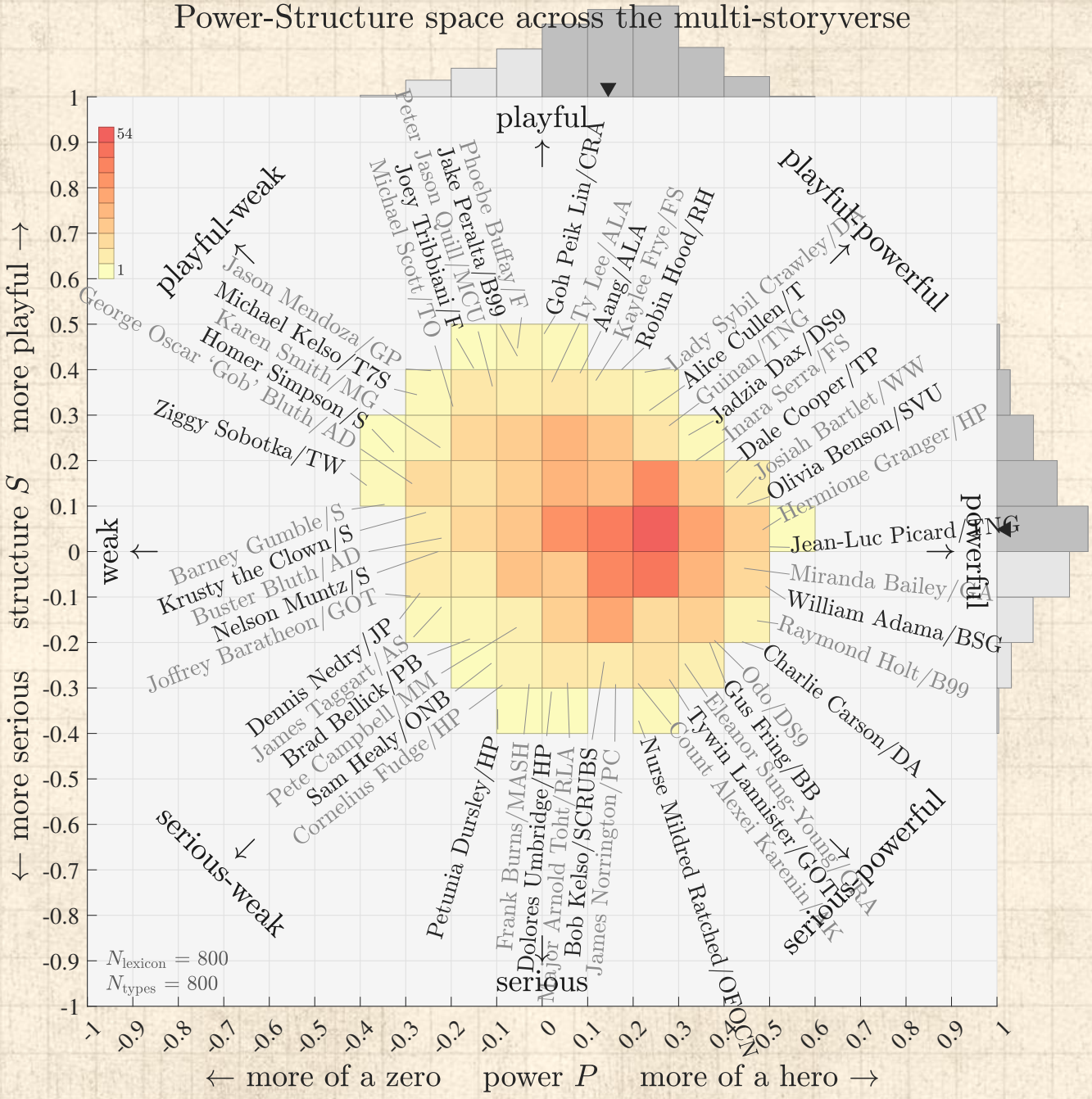

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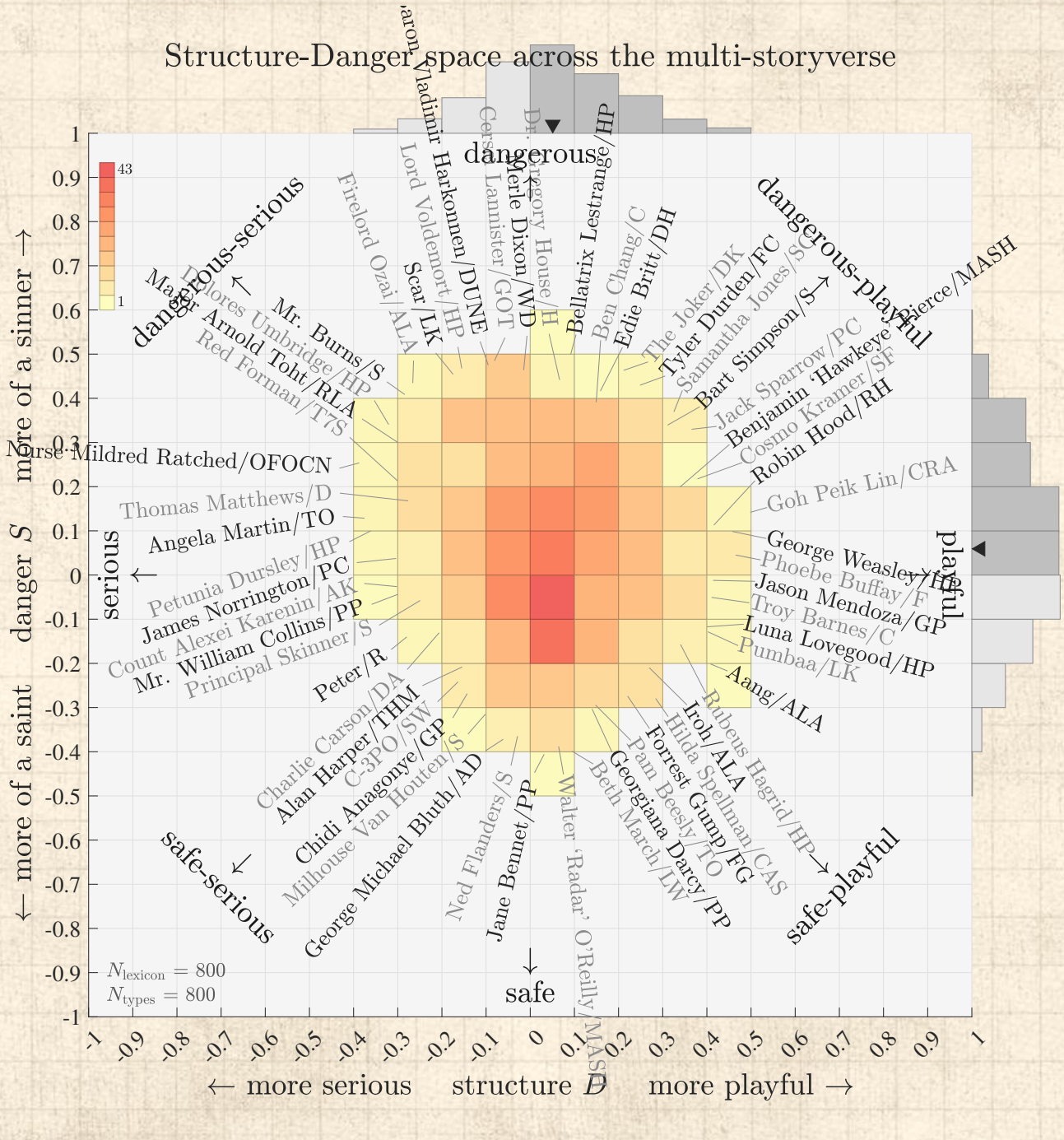

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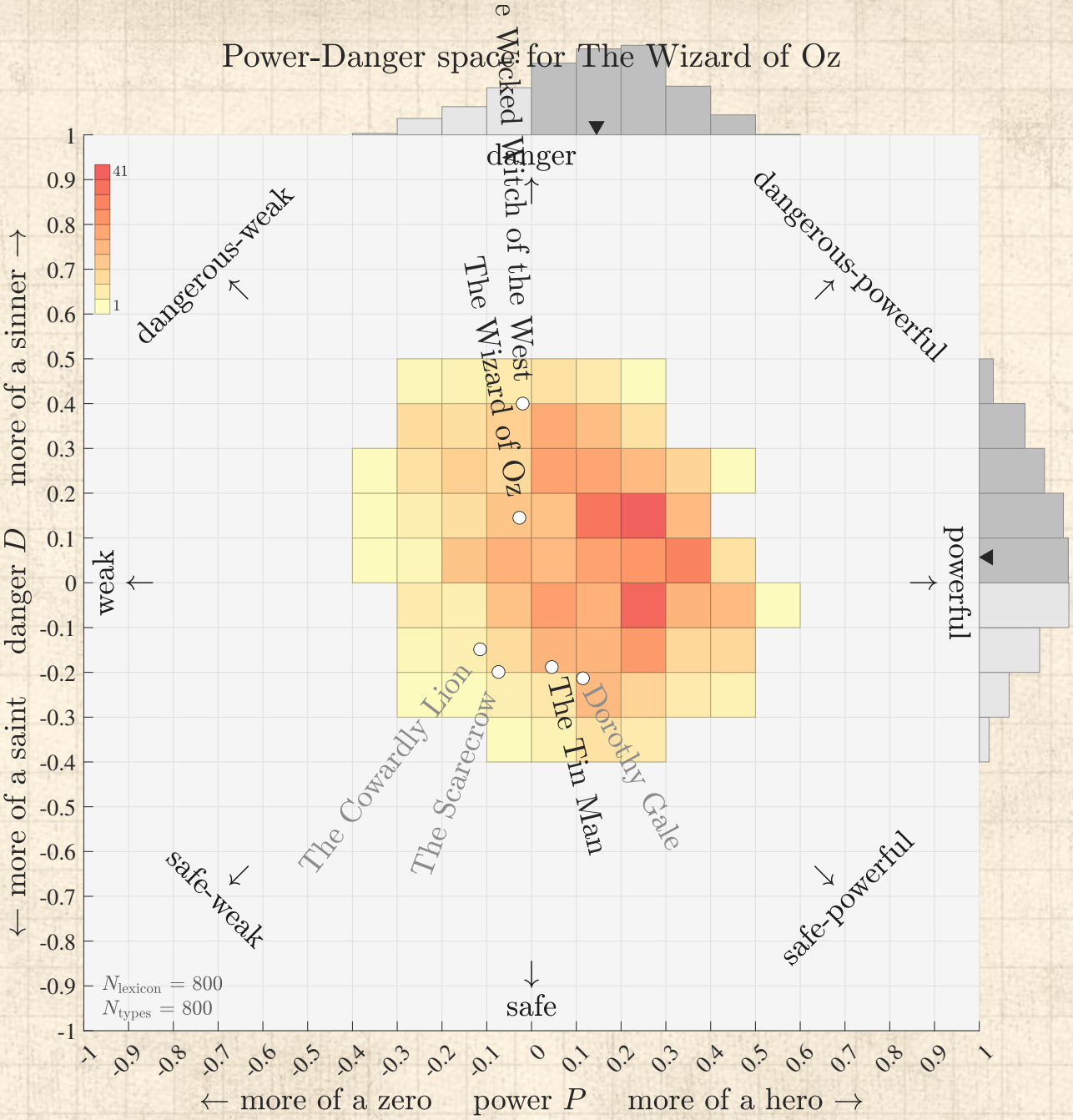

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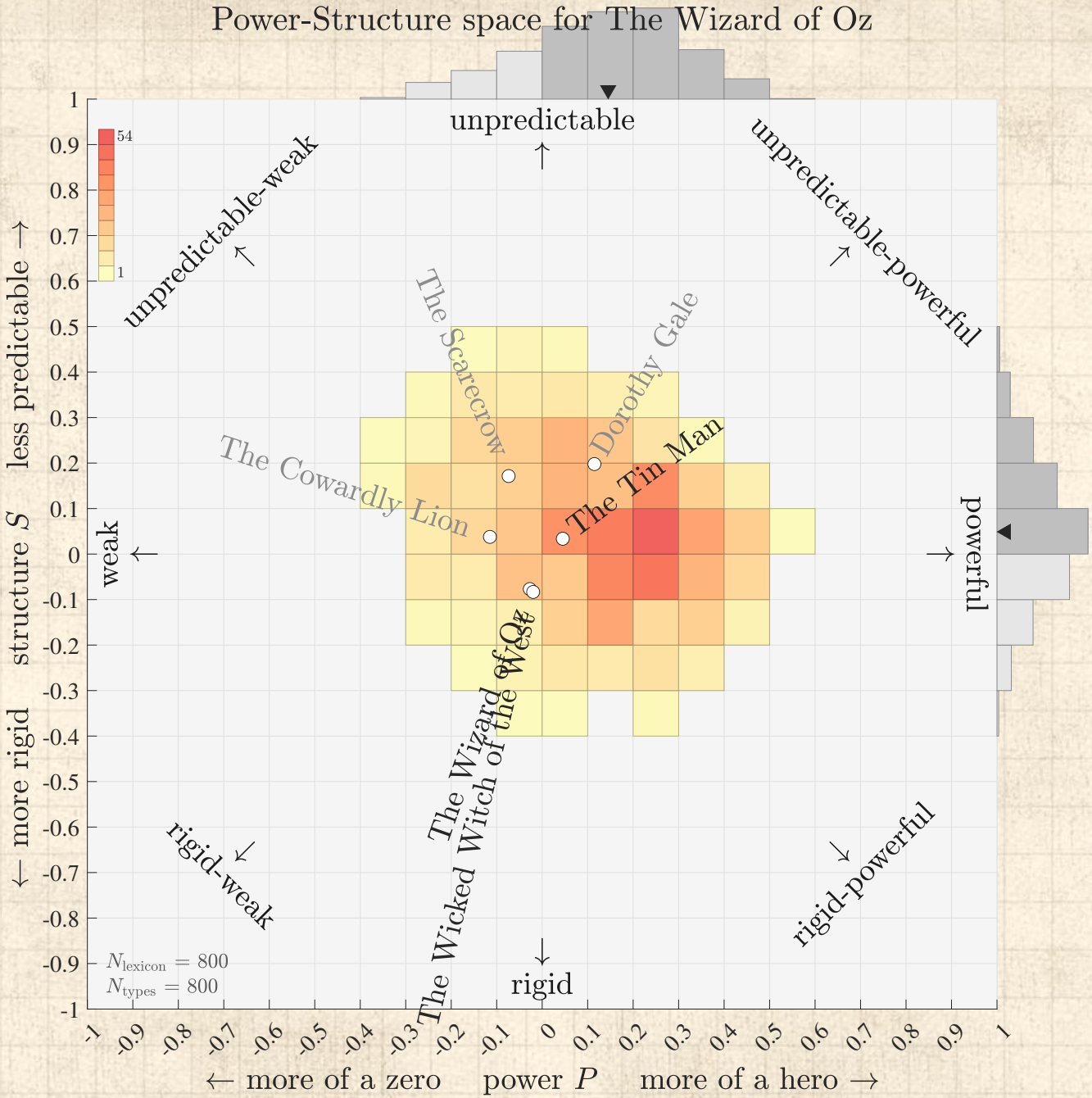

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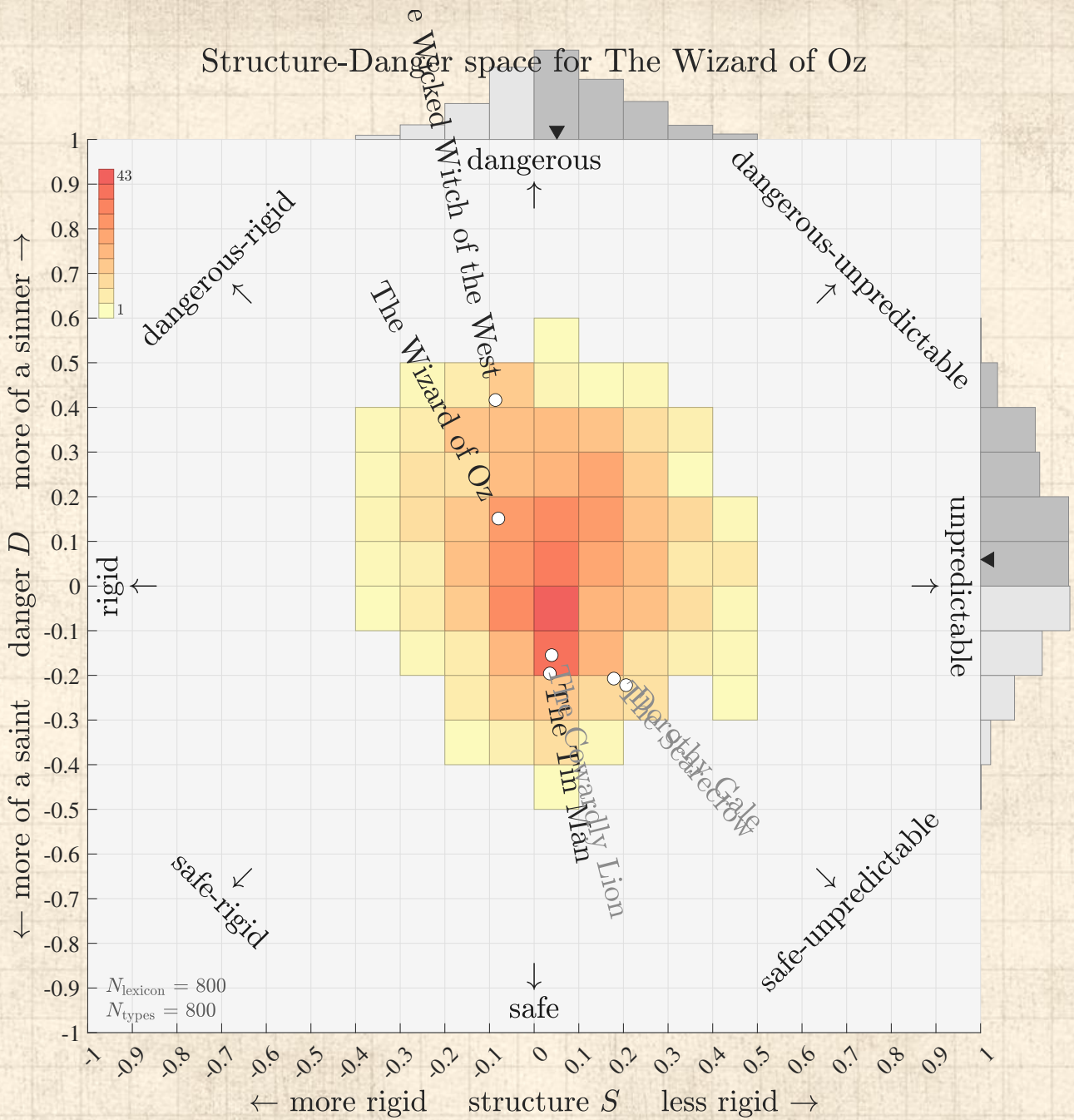

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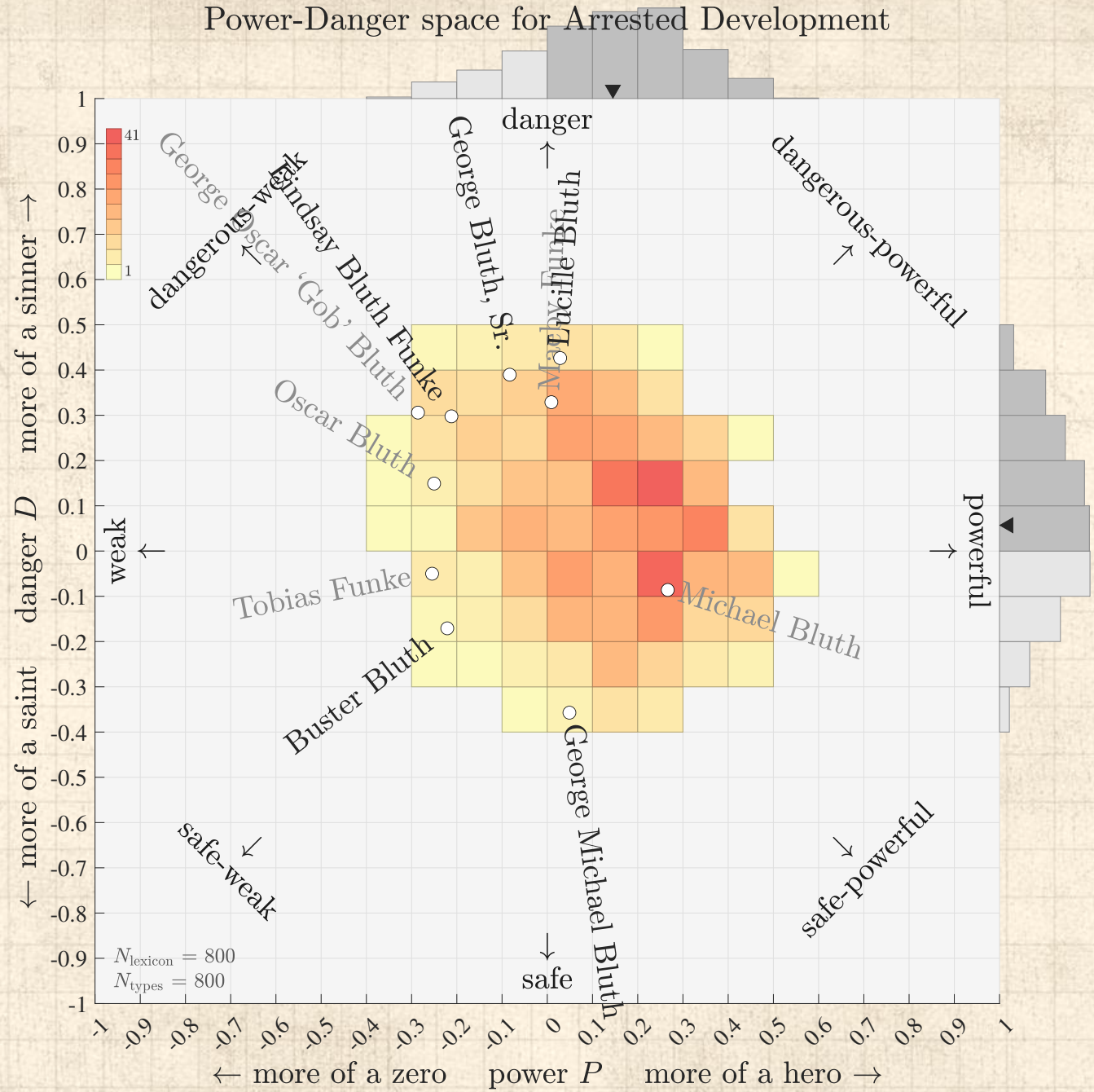
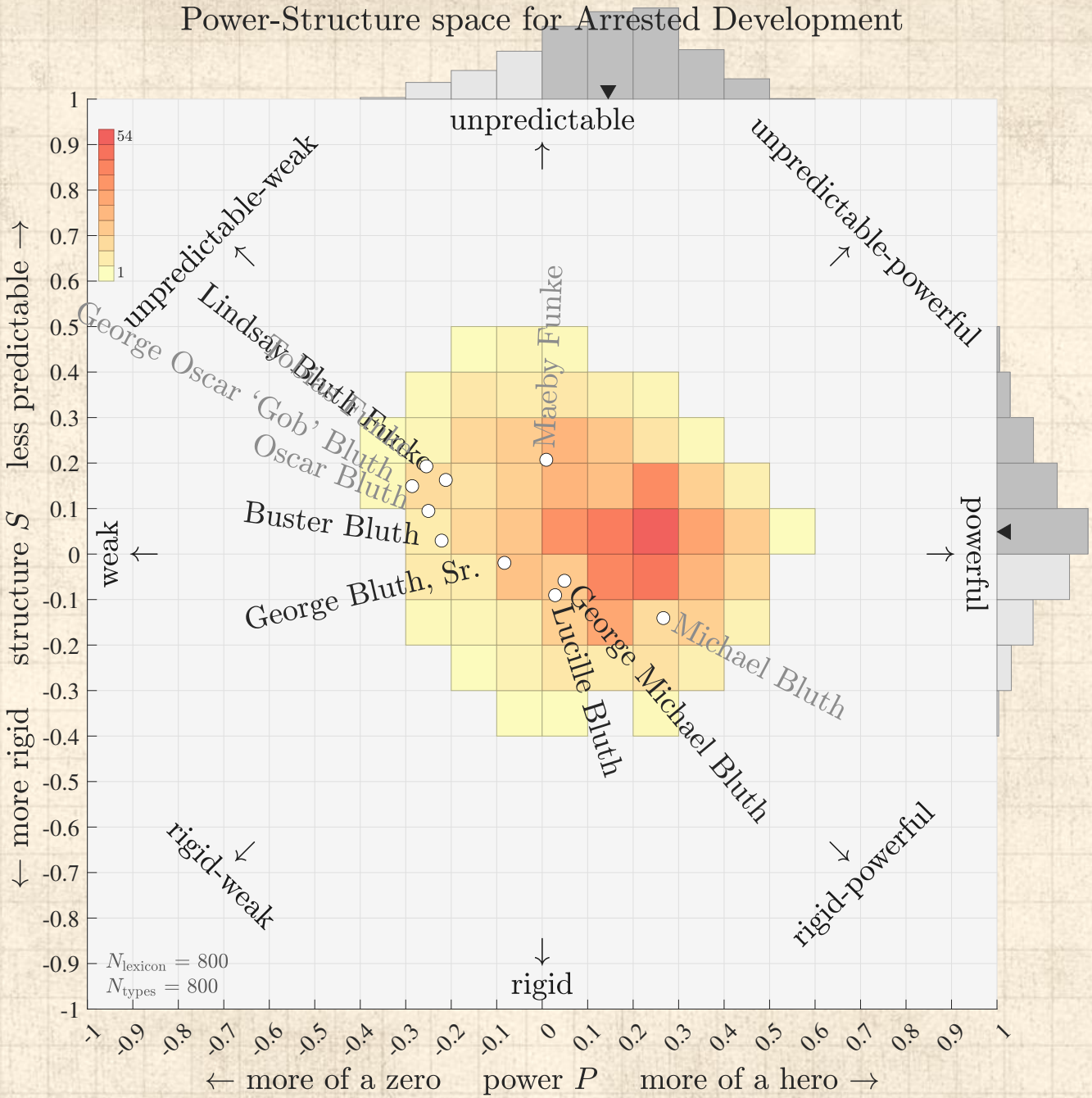

Power-Danger space for Arrested Development
danger
dangerous-powerful
dangerous-weak
George Bluth, Sr.
Lucille Bluth
Lindsay Bluth Funke
George Oscar 'Gob' Bluth
Oscar Bluth
Tobias Funke
Michael Bluth
Buster Bluth
George Michael Bluth
safe-weak
safe-powerful
safe
weak
powerful
← more of a saint danger D more of a sinner →
← more of a zero power P more of a hero →
$N_{\text{lexicon}} = 800$
$N_{\text{types}} = 800$
41
1

dangerous
murderess
homicide
dangerous
murderer
assassinate
earthquake
toxic
chaos
killer
aggression
pissed
crucifixion



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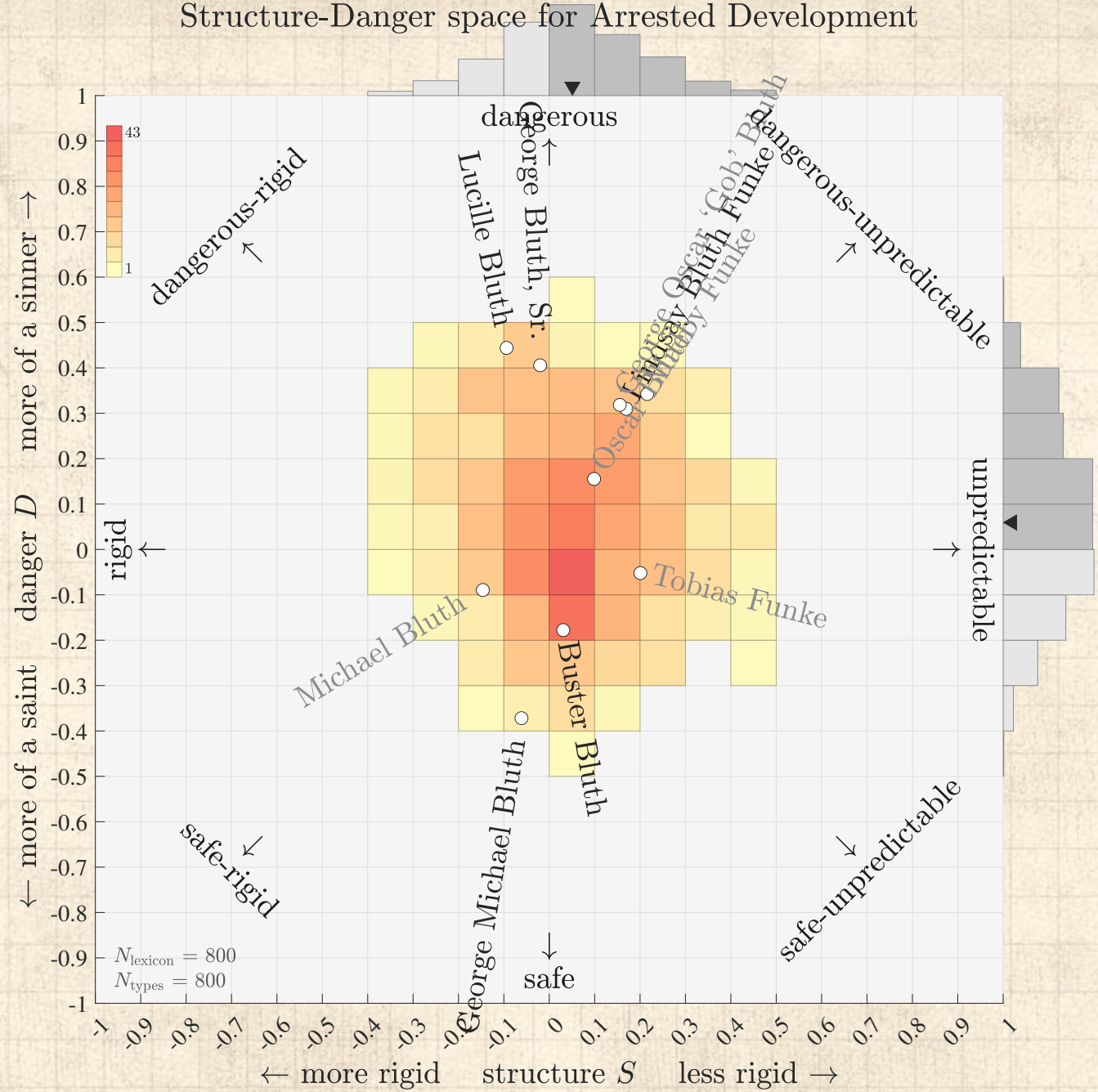

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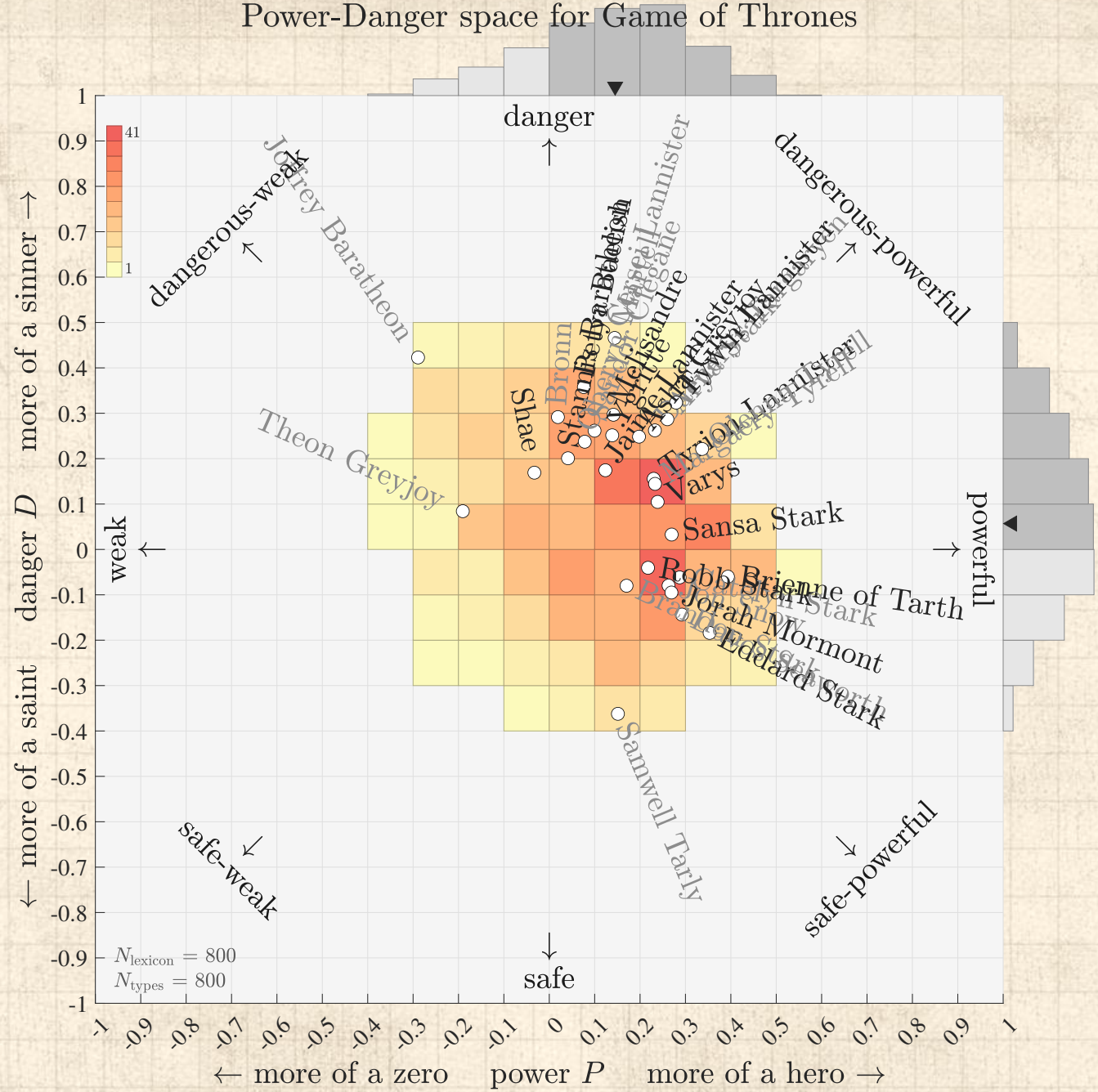
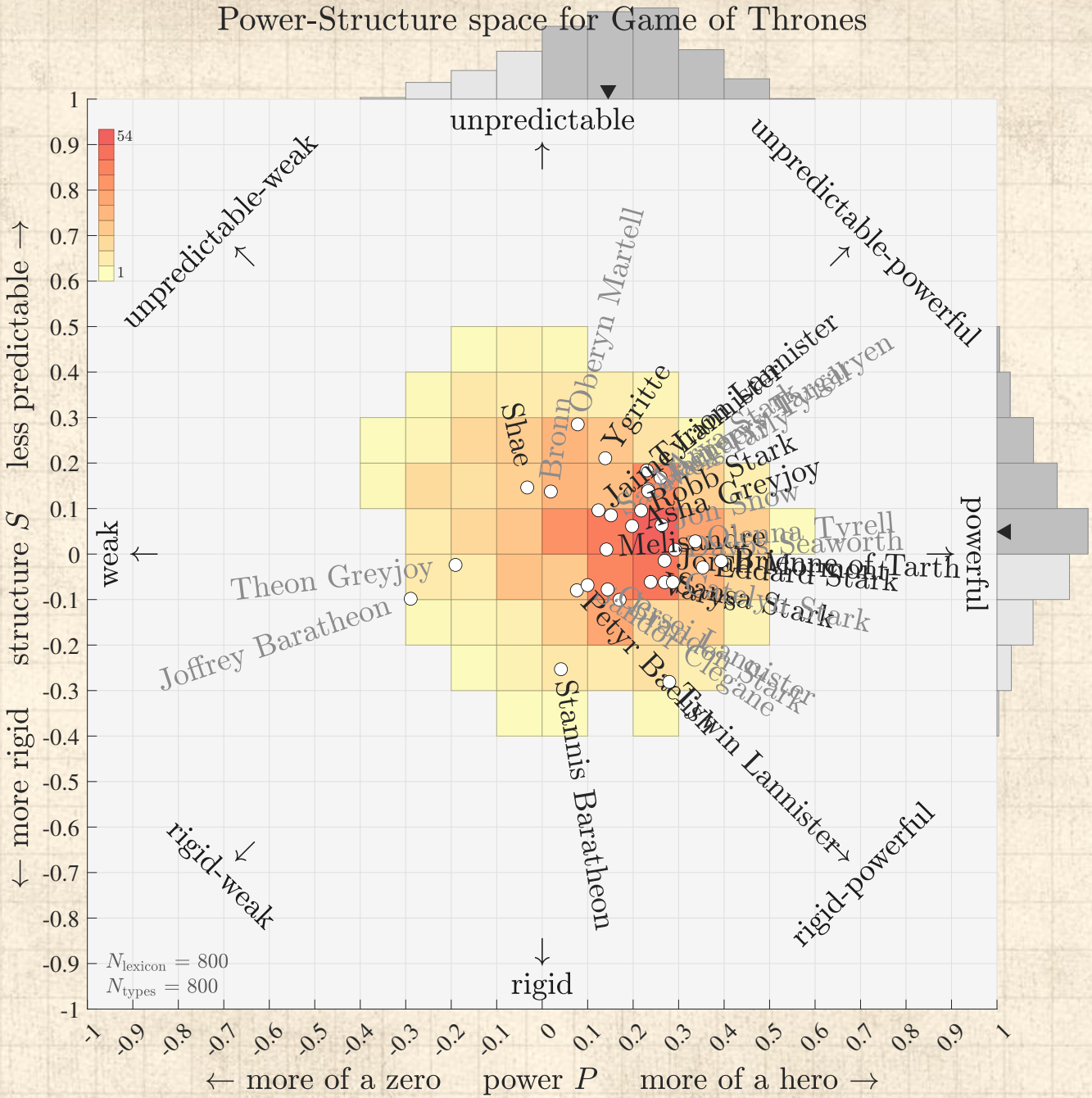

Power-Danger space for Game of Thrones
danger
dangerous-weak
dangerous-powerful
weak
powerful
safe-weak
safe-powerful
safe
← more of a saint danger D more of a sinner →
← more of a zero power P more of a hero →
Jeoffrey Baratheon
Theon Greyjoy
Shae
Stannis Baratheon
Jaime Lannister
Tyrion Lannister
Varys
Sansa Stark
Robb Stark
Brienne of Tarth
Jorah Mormont
Eddard Stark
Samwell Tarly
$N_{\text{lexicon}} = 800$
$N_{\text{types}} = 800$
41
1

dangerous
murderess
homicide
dangerous
murderer
assassinate
earthquake
toxic
chaos
killer
aggression
pissed
crucifixion



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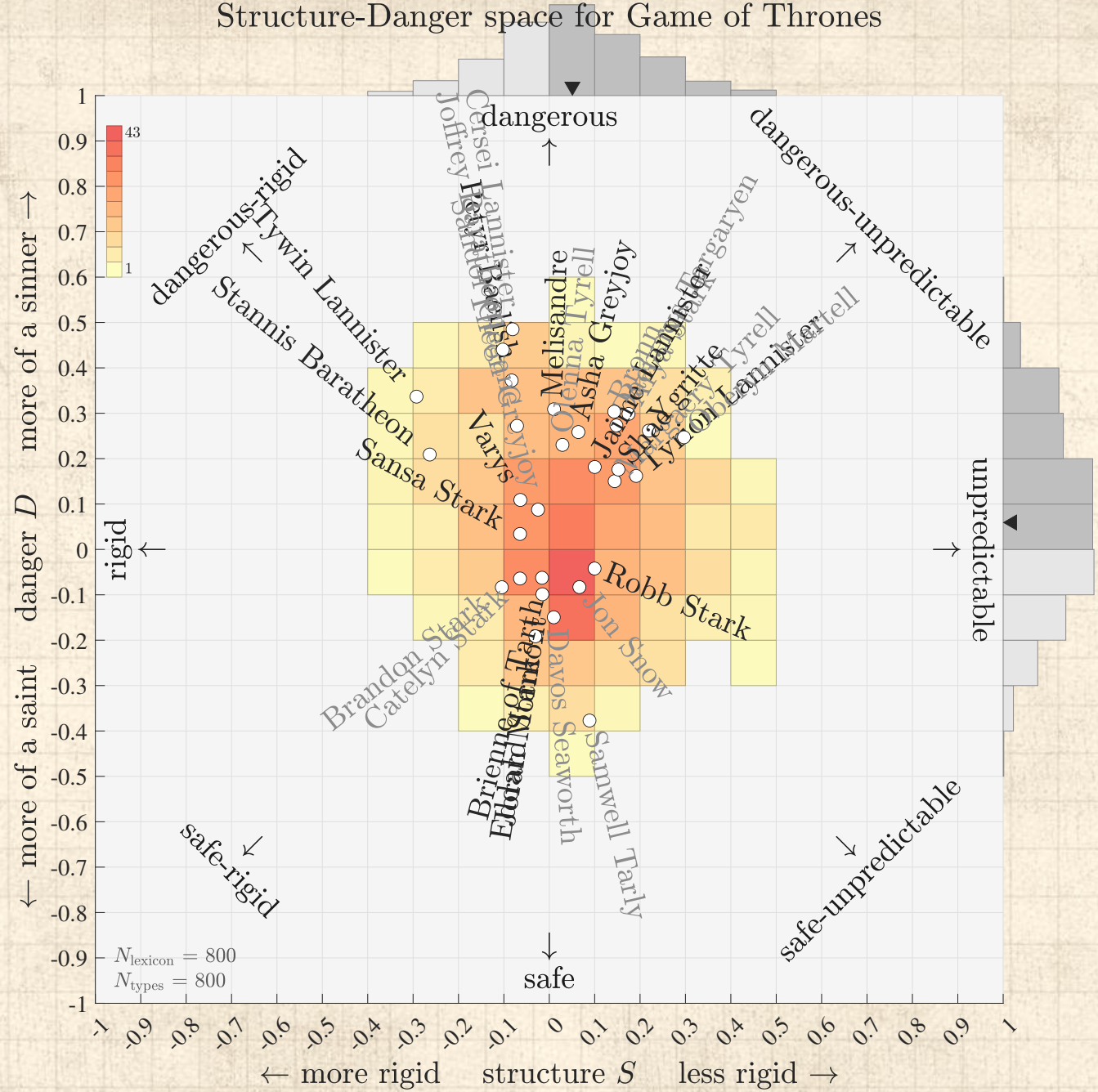
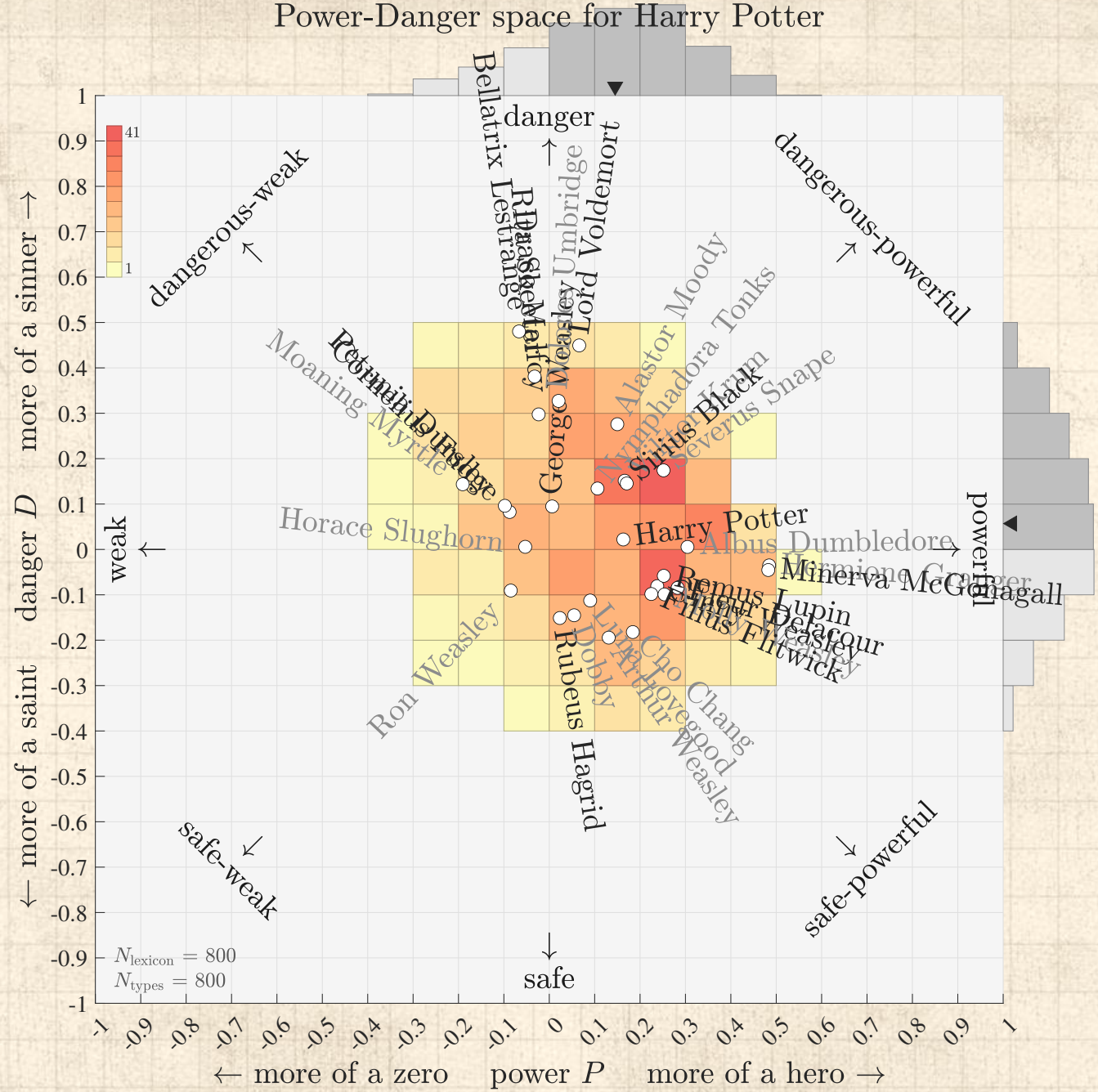

Structure-Danger space for Game of Thrones
dangerous
dangerous-rigid
dangerous-unpredictable
rigid
unpredictable
safe-rigid
safe-unpredictable
safe
← more of a saint danger D more of a sinner →
← more rigid structure S less rigid →
Tywin Lannister
Stannis Baratheon
Melisandre
Asha Greyjoy
Varys
Sansa Stark
Robb Stark
Jon Snow
Davos Seaworth
Samwell Tarly
Brienne of Tarth
Brandon Stark
Catelyn Stark
Tyrion Lannister
Shae
$N_{\text{lexicon}} = 800$
$N_{\text{types}} = 800$

dangerous
murderess
homicide
dangerous
murderer
assassinate
earthquake
toxic
chaos
killer
aggression
pissed
crucifixion



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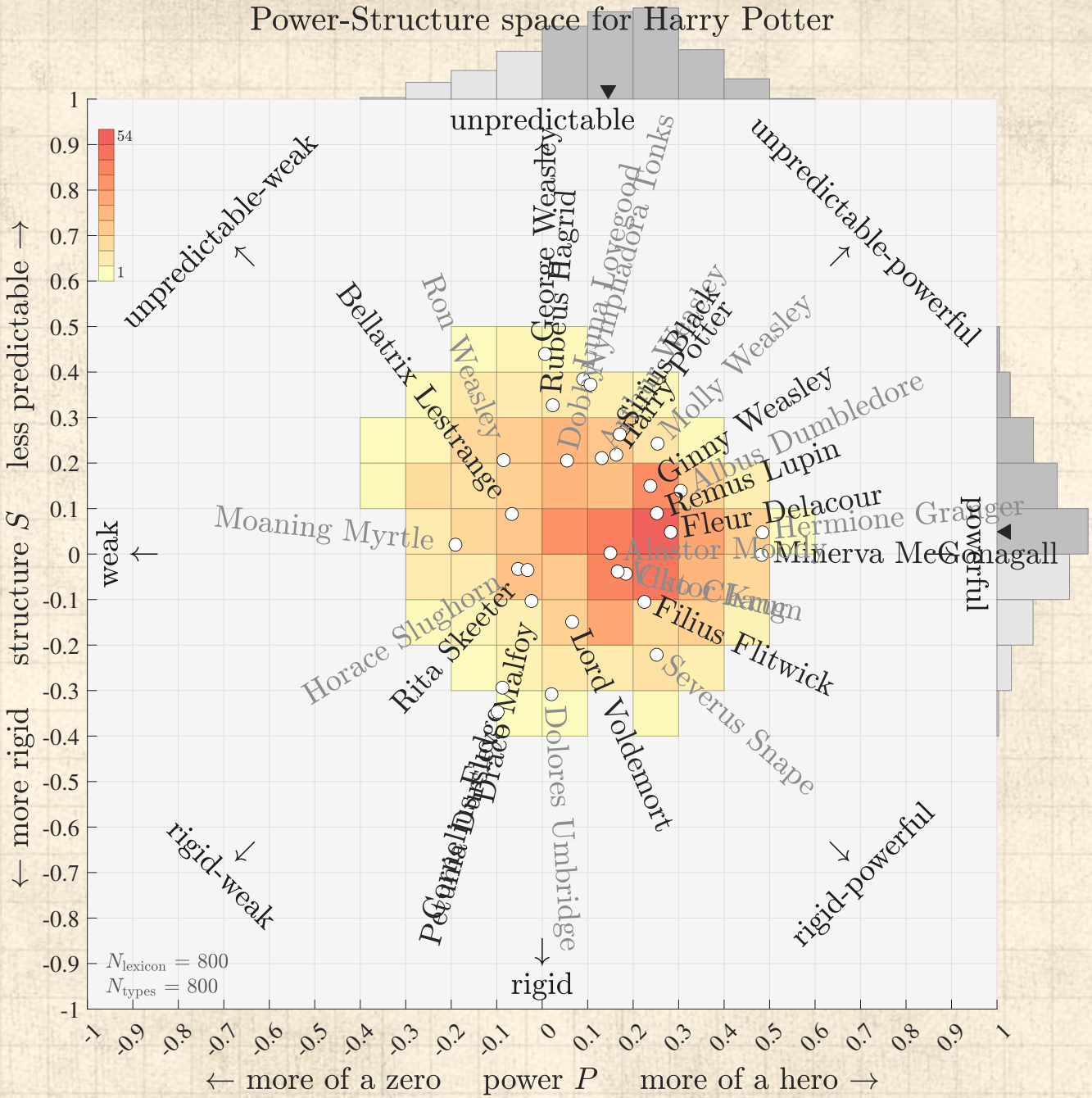

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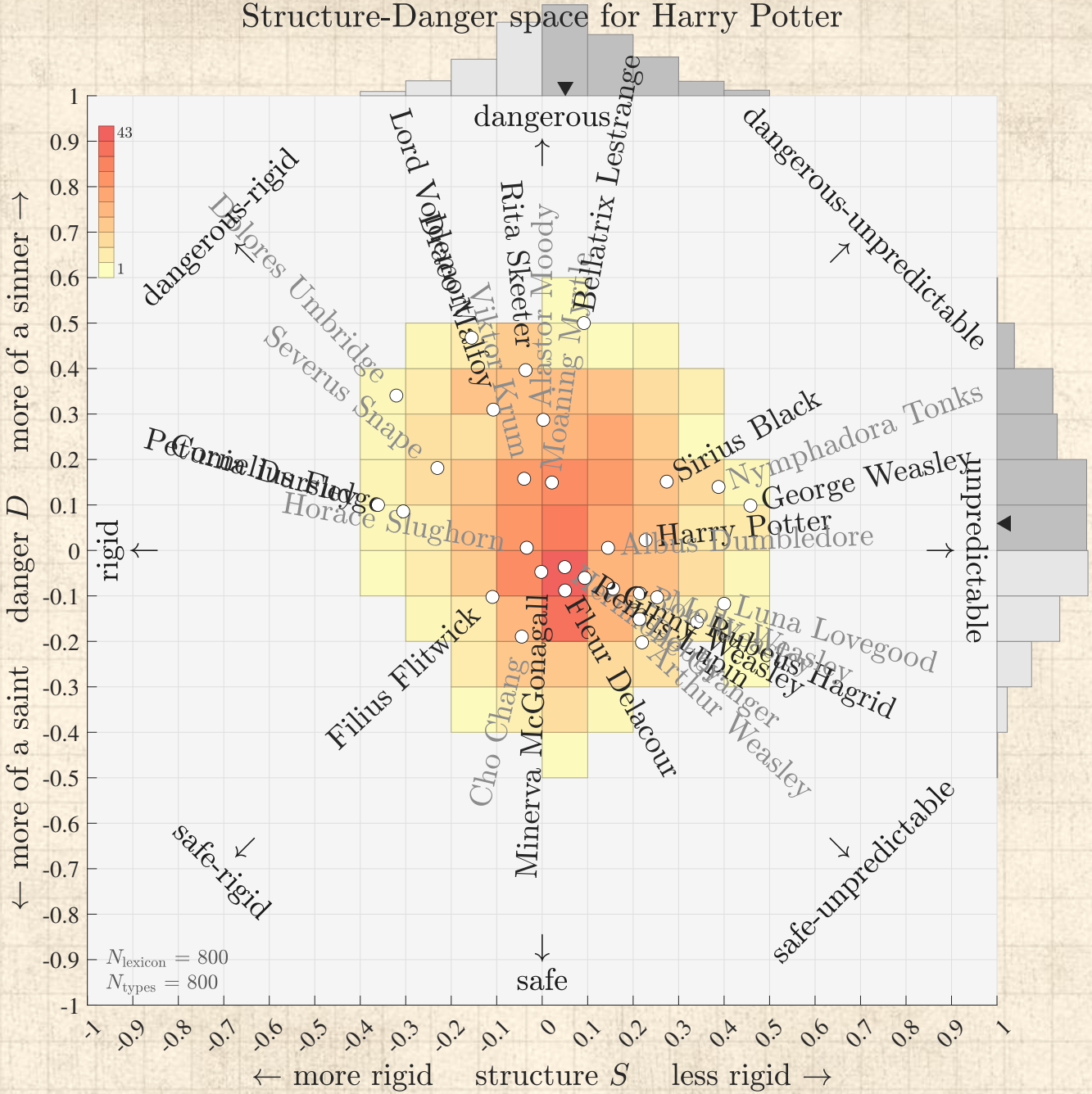

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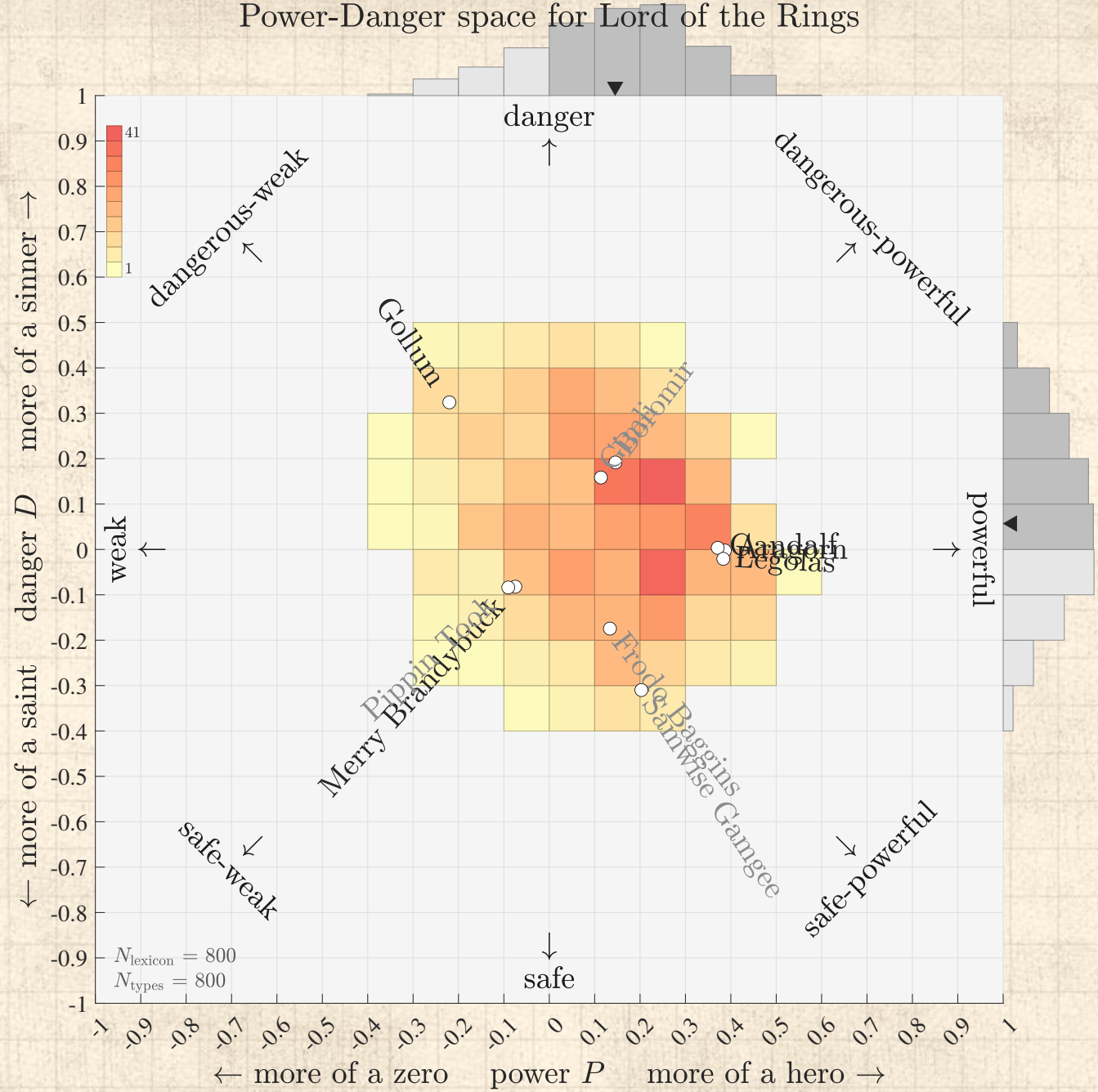

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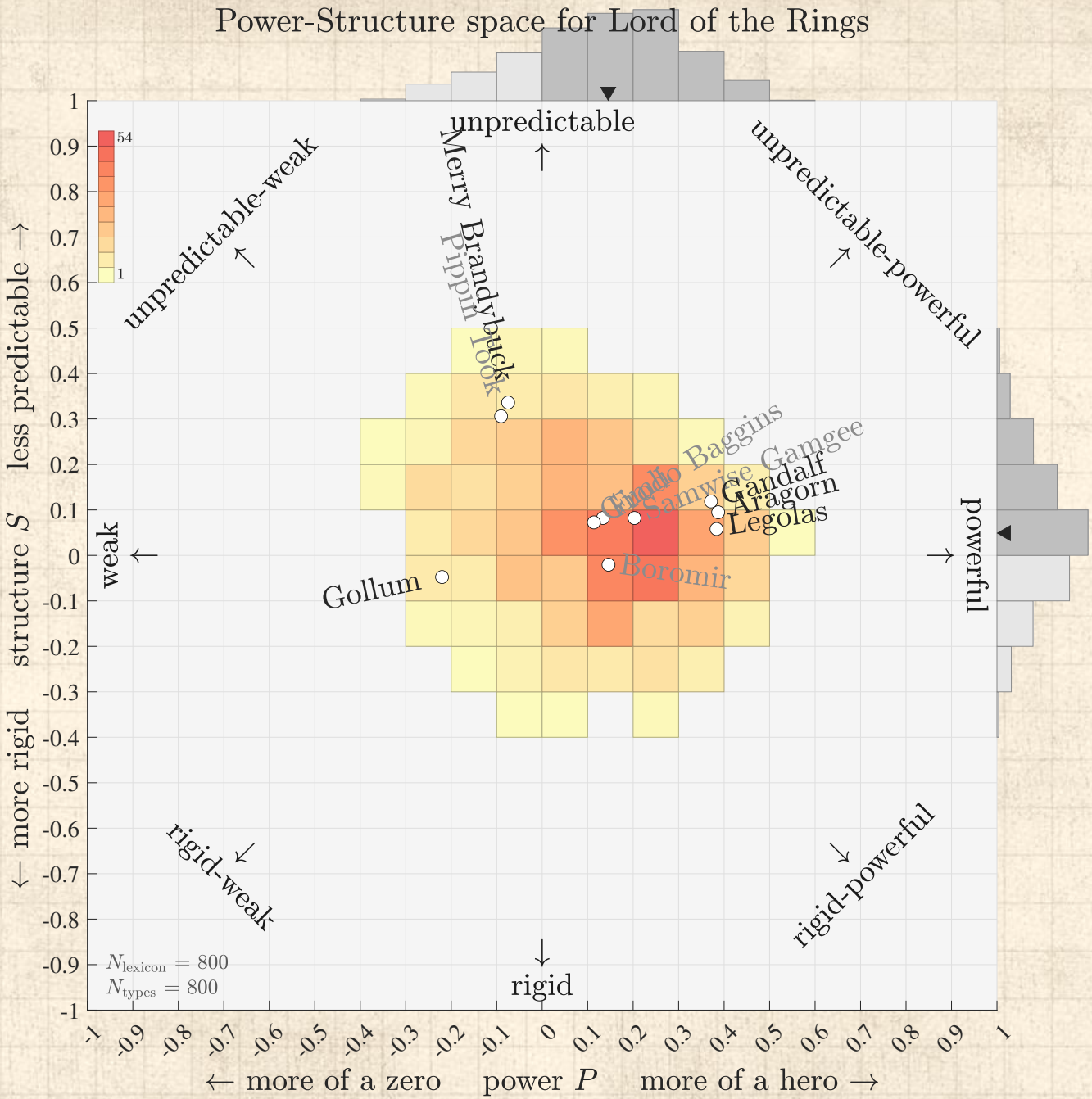

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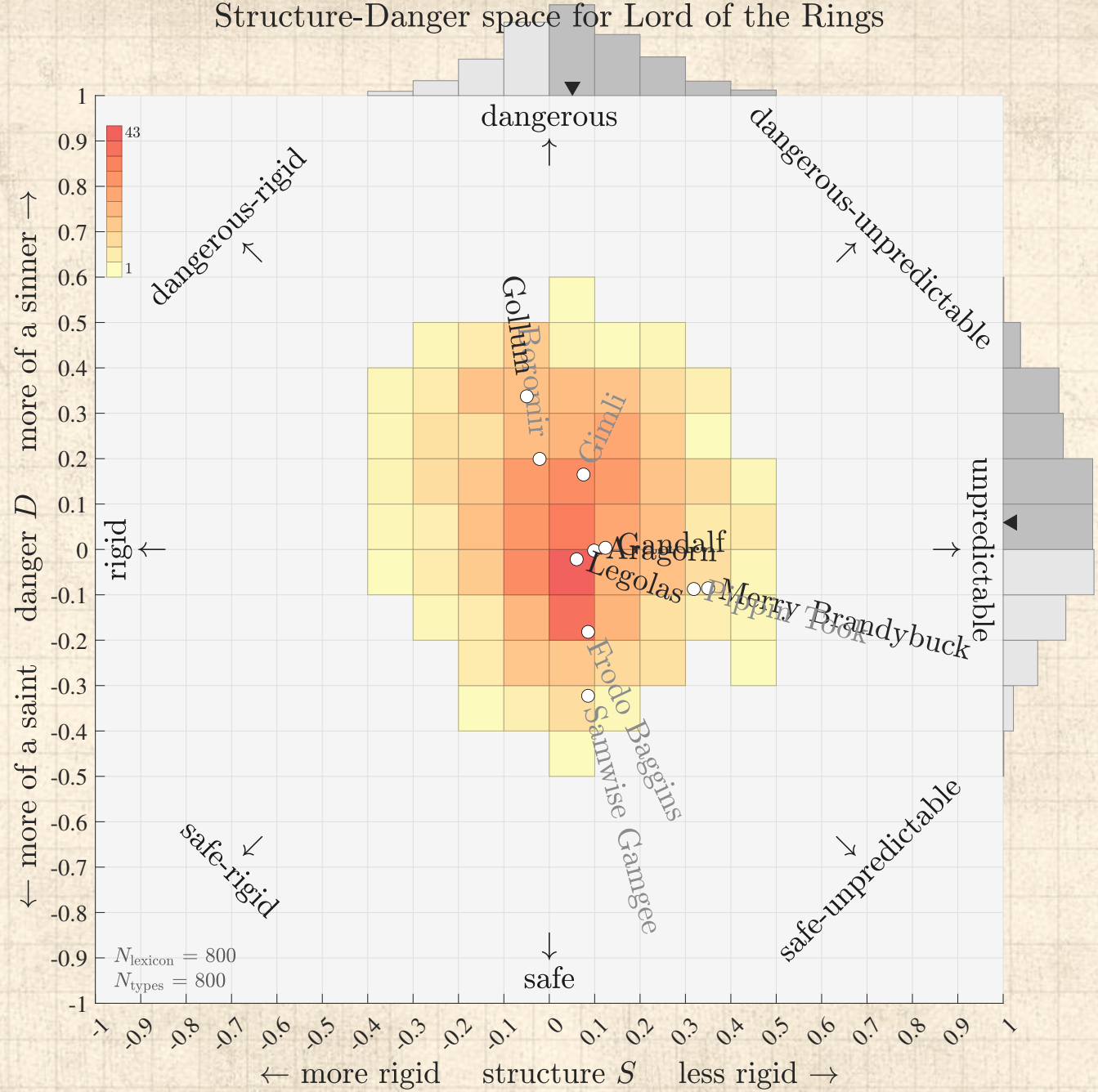

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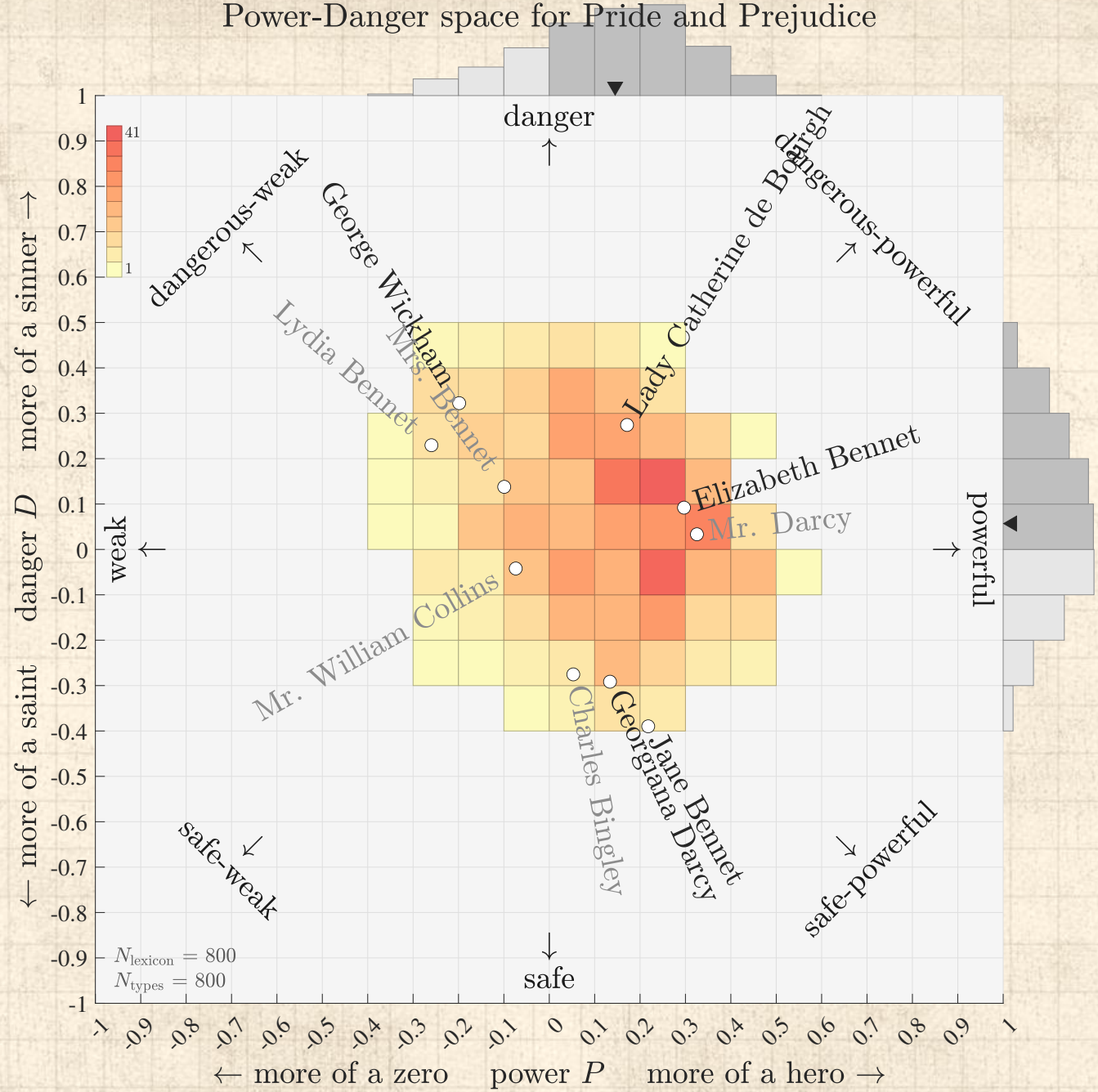

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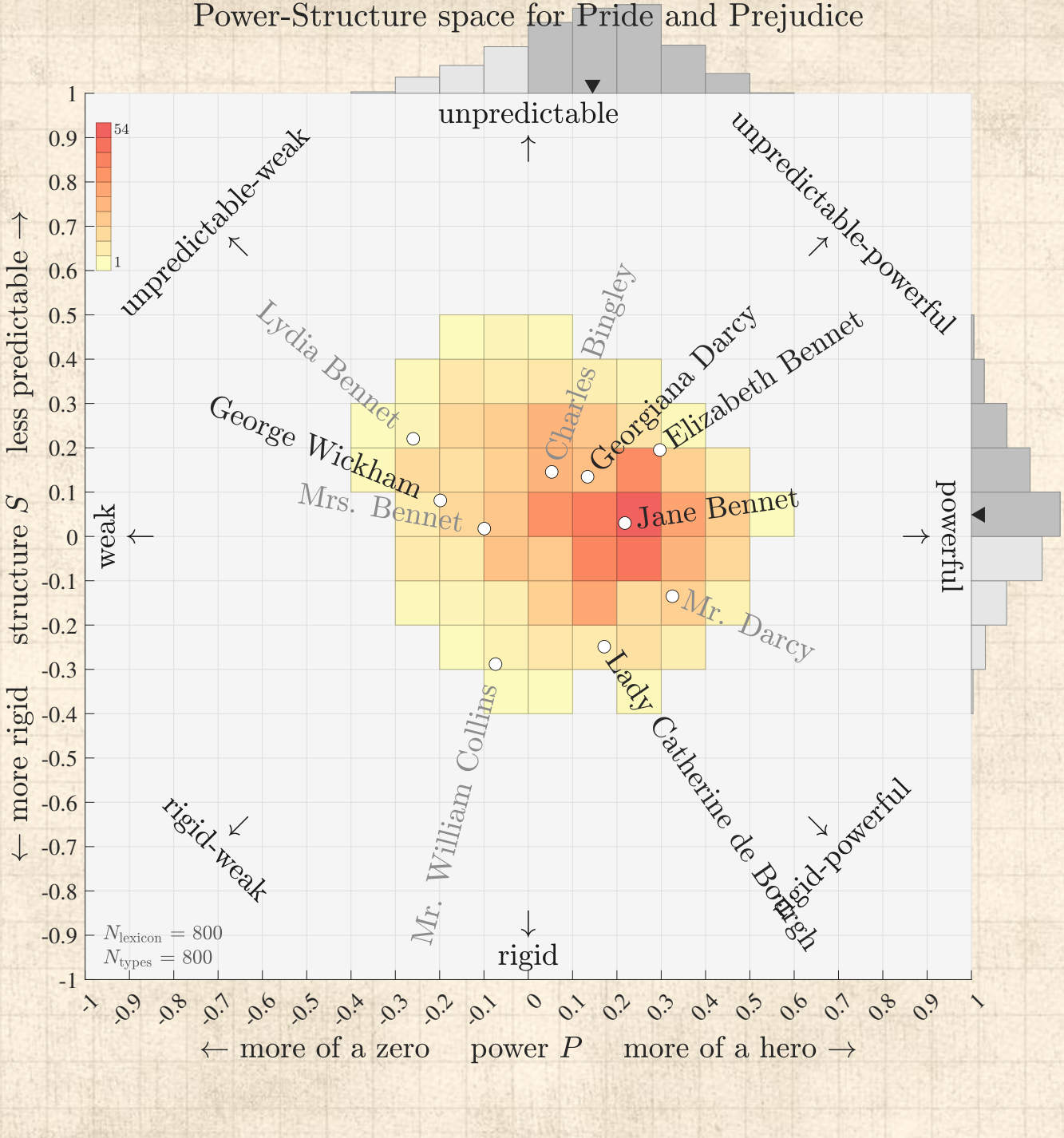
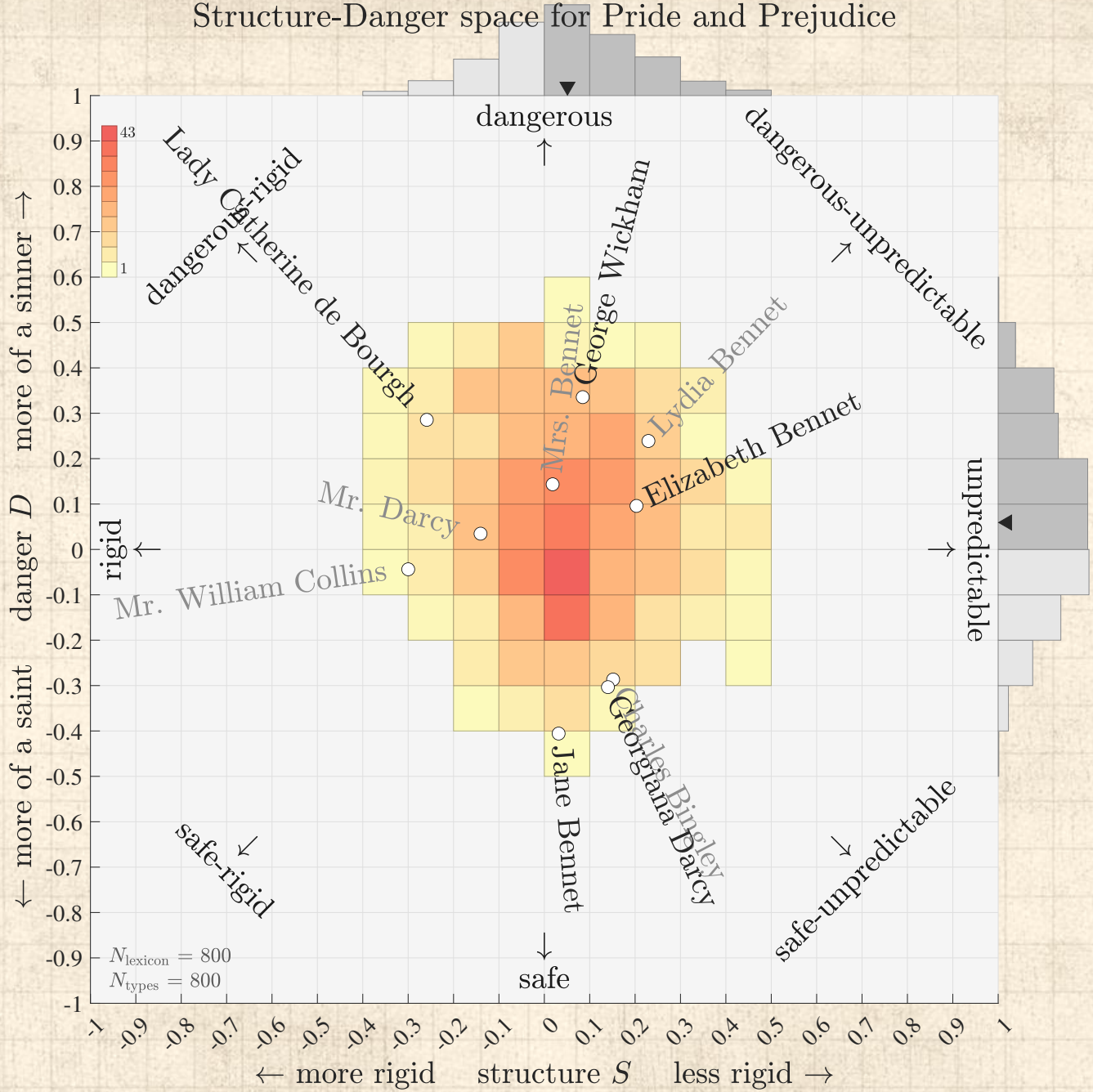
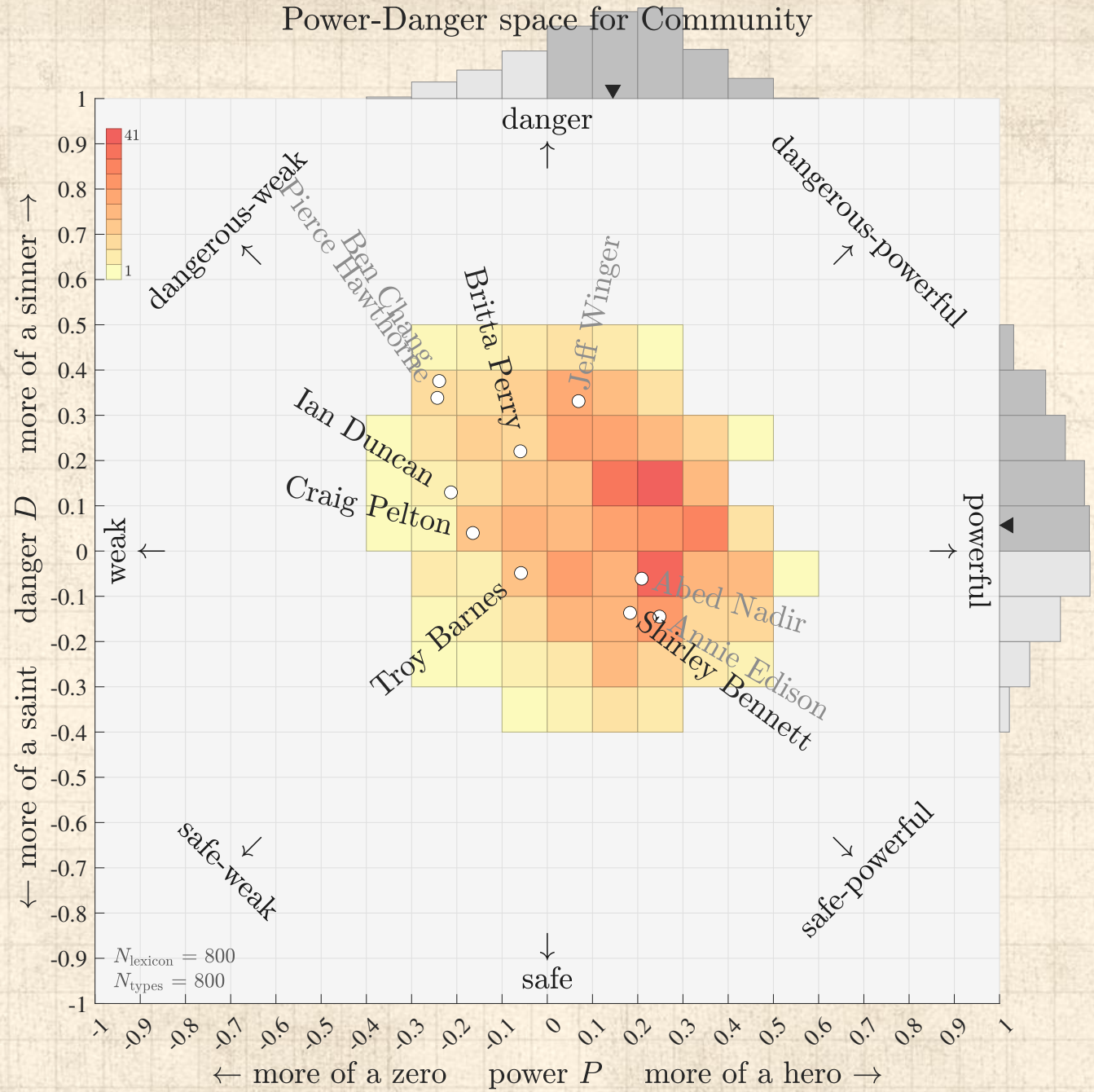

Power-Structure space for Pride and Prejudice
unpredictable
unpredictable-weak
unpredictable-powerful
Lydia Bennet
Charles Bingley
Georgiana Darcy
Elizabeth Bennet
George Wickham
Mrs. Bennet
Jane Bennet
Mr. Darcy
Lady Catherine de Bourgh
Mr. William Collins
rigid-weak
rigid-powerful
rigid
weak
powerful
54
1
$N_{\text{lexicon}} = 800$
$N_{\text{types}} = 800$
← more rigid structure S less predictable →
← more of a zero power P more of a hero →

dangerous
murderess
homicide
dangerous
murderer
assassinate
earthquake
toxic
chaos
killer
aggression
pissed
crucifixion


Structure-Danger space for Pride and Prejudice
dangerous
dangerous-unpredictable
unpredictable
safe-unpredictable
safe
safe-rigid
rigid
dangerous-rigid
Lady Catherine de Bourgh
George Wickham
Mrs. Bennet
Lydia Bennet
Elizabeth Bennet
Mr. Darcy
Mr. William Collins
Jane Bennet
Charles Bingley
Georgiana Darcy
43
1
$N_{\text{lexicon}} = 800$
$N_{\text{types}} = 800$
← more of a saint danger D more of a sinner →
← more rigid structure S less rigid →

dangerous
murderess
homicide
dangerous
murderer
assassinate
earthquake
toxic
chaos
killer
aggression
pissed
crucifixion



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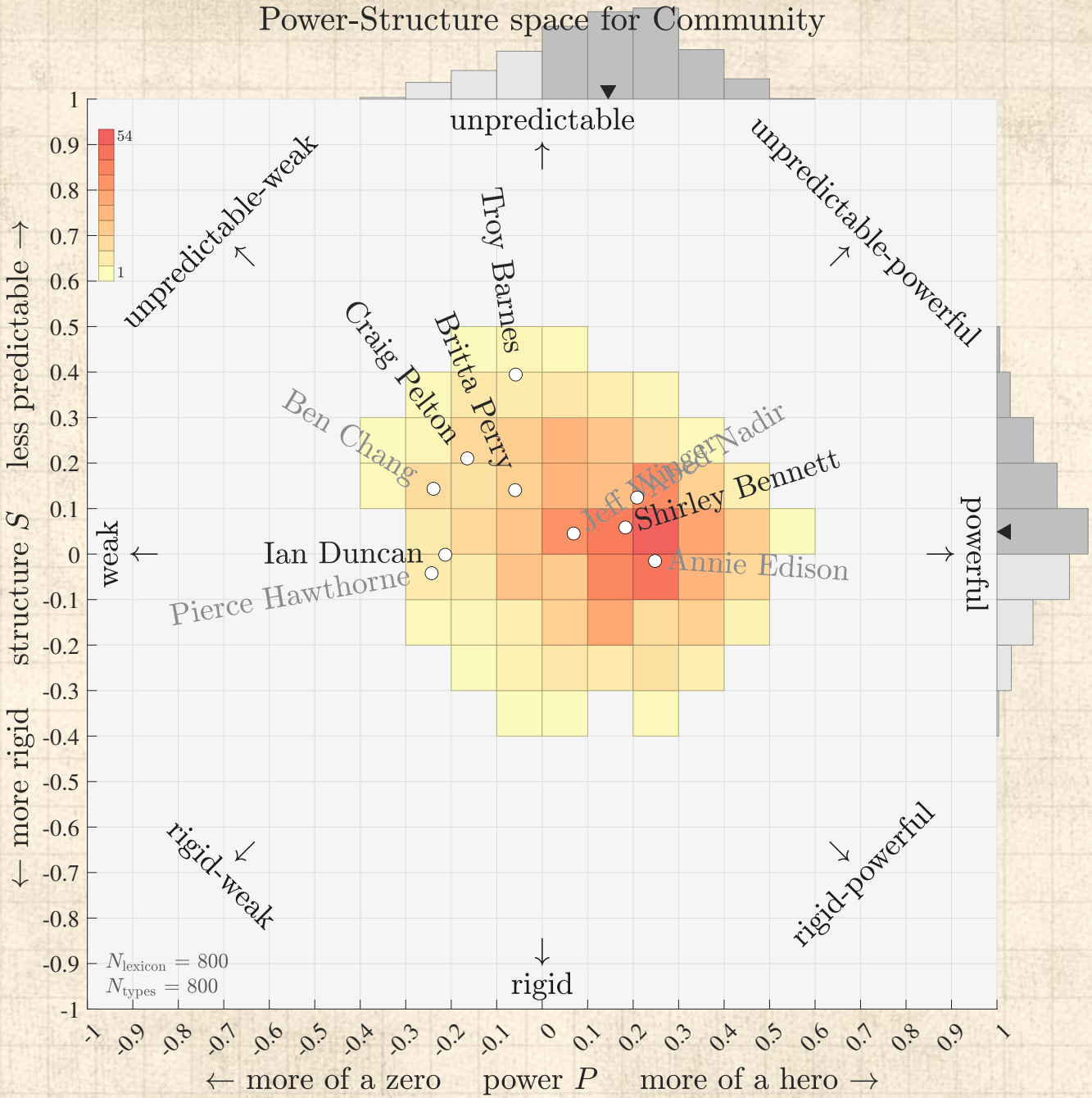

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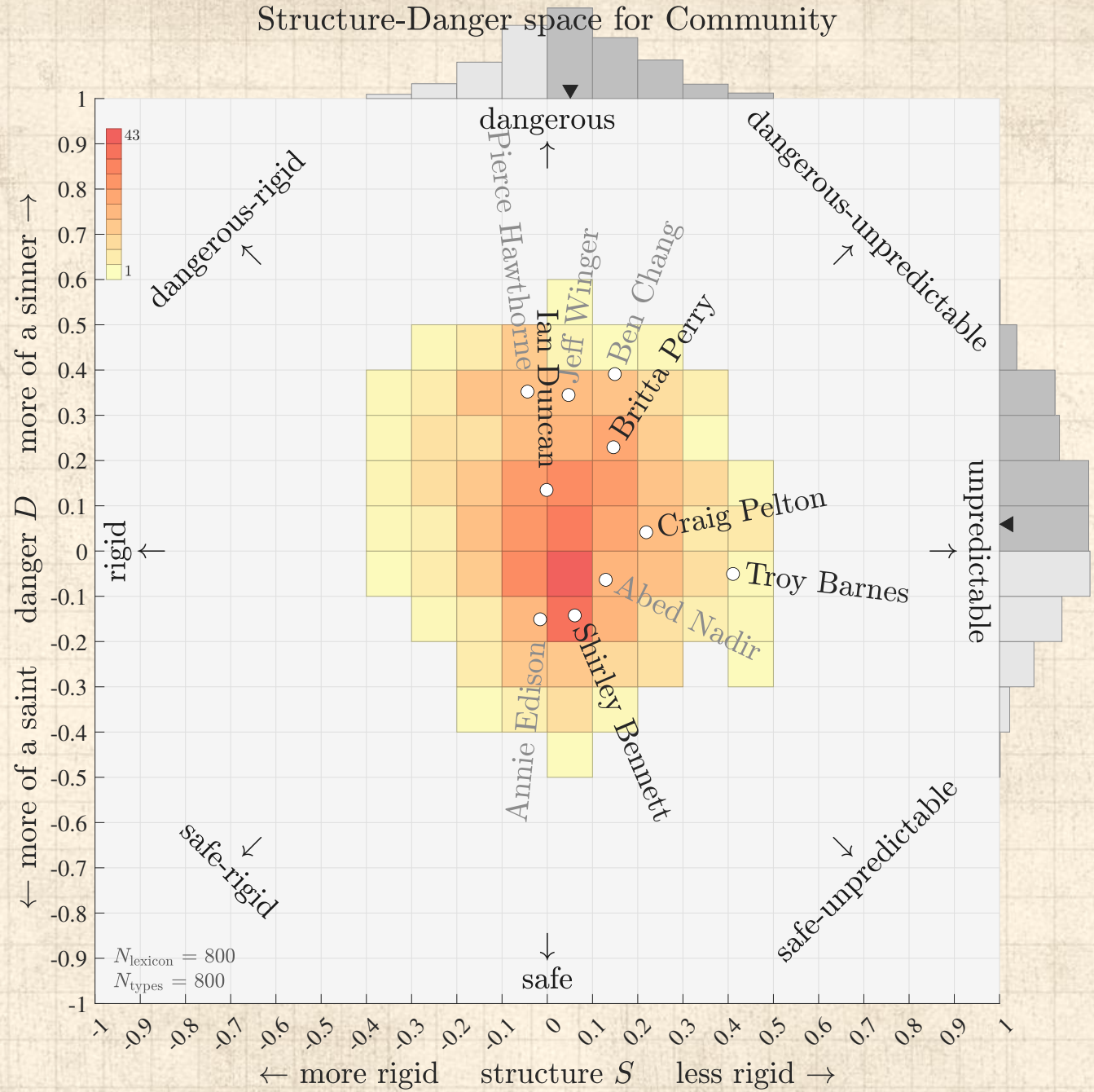

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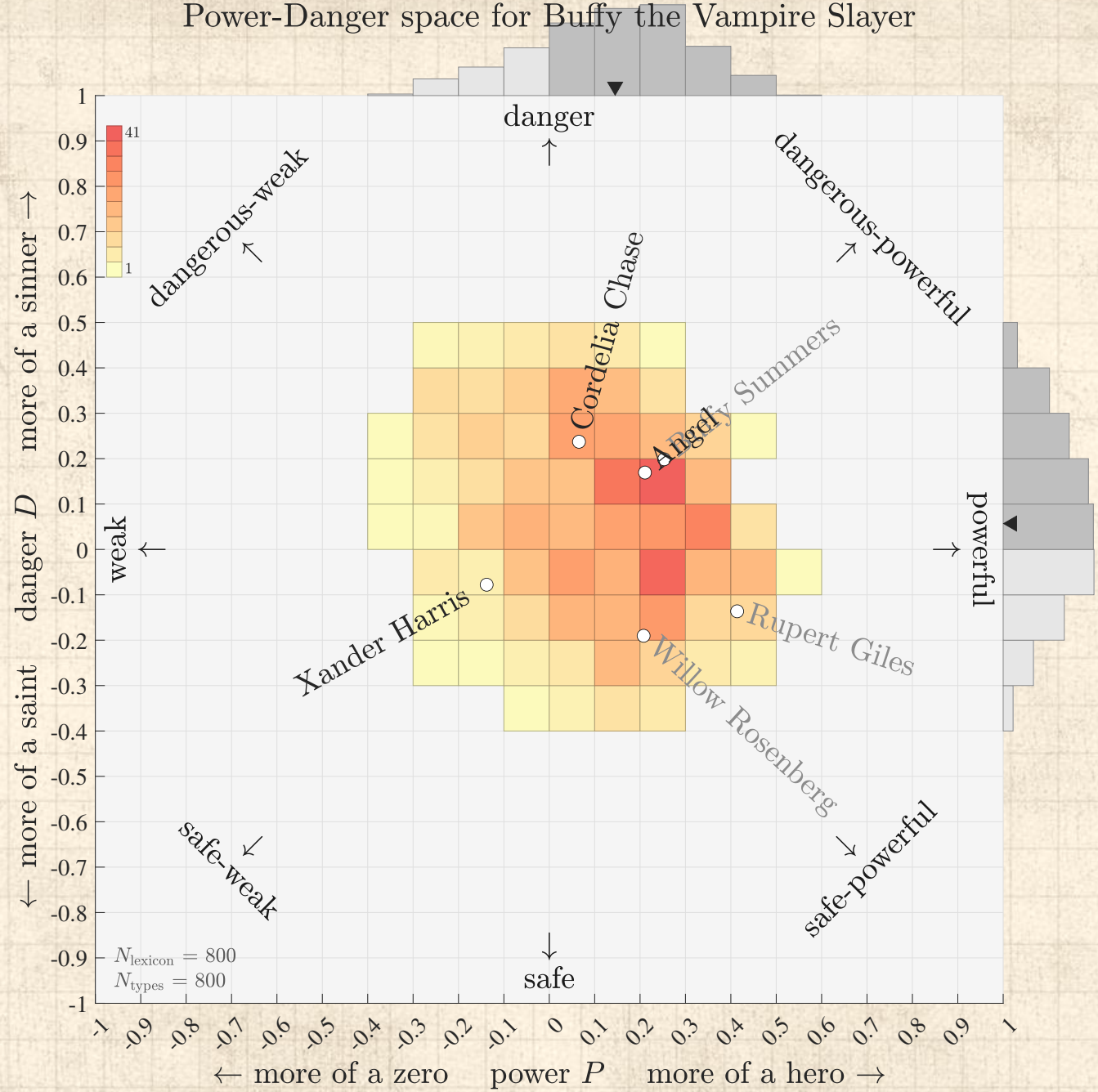
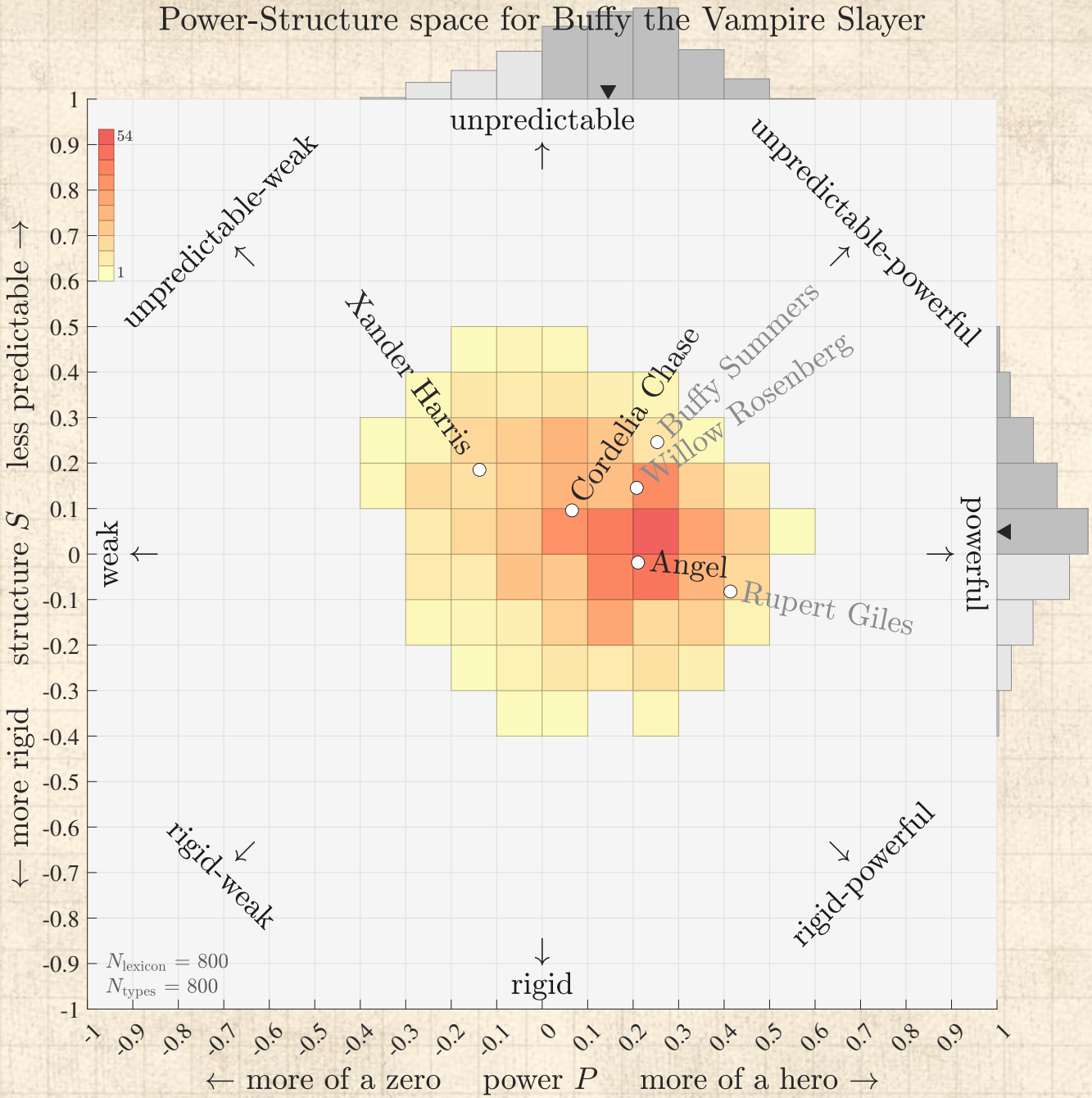

Power-Danger space for Buffy the Vampire Slayer
danger
dangerous-weak
dangerous-powerful
weak
powerful
safe-weak
safe-powerful
safe
← more of a saint danger D more of a sinner →
← more of a zero power P more of a hero →
Cordelia Chase
Buffy Summers
Angel
Xander Harris
Rupert Giles
Willow Rosenberg
41
1
$N_{\text{lexicon}} = 800$
$N_{\text{types}} = 800$

dangerous
murderess
homicide
dangerous
murderer
assassinate
earthquake
toxic
chaos
killer
aggression
pissed
crucifixion



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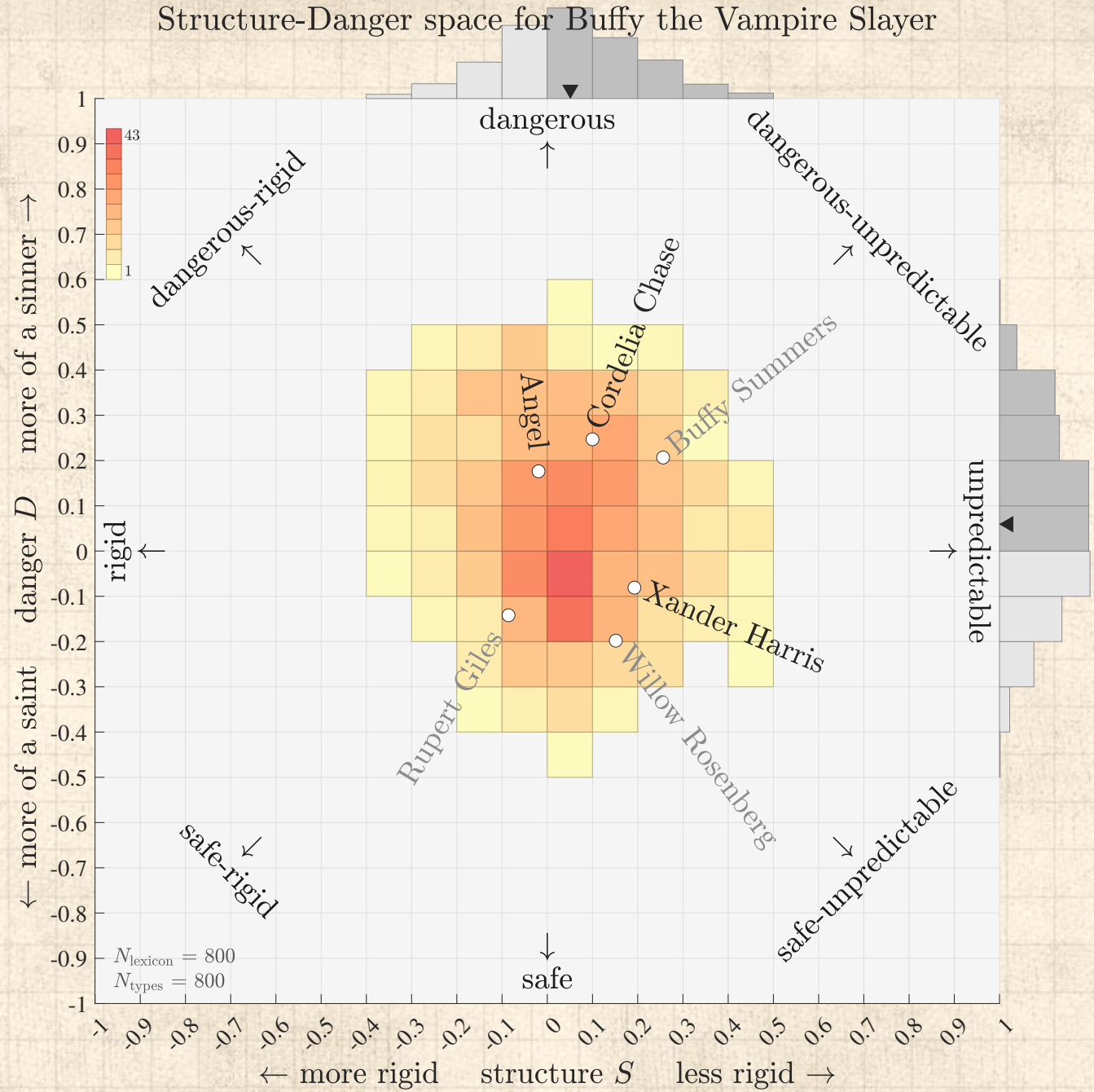

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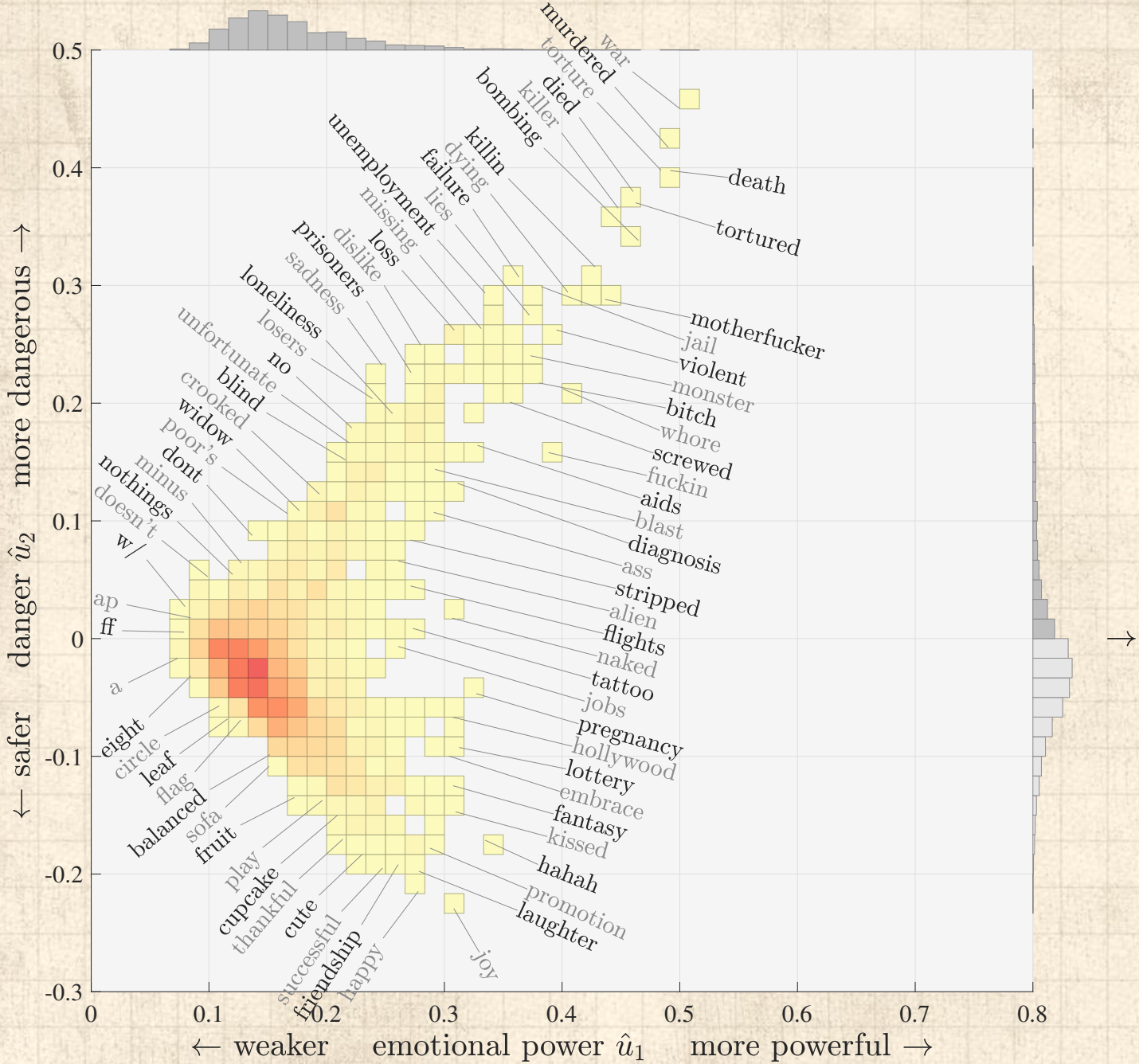
Six emotions, collapsed:



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Findings, observations, possibilities:

- Power-danger-structure framework emerges in distinct settings, fitting types and tokens.
- Safety bias of communication refines Pollyanna Principle of positivity
- Happiness/Goodness = Power + Safety
- Ousiometer can be improved and refined.
- Possible: Emotions map onto powerful-safe and danger axes.
- Power-danger framework for survival.
- Possible: Telegnomics for stories—Measuring character arcs, plots.
- Complement to information theory which is meaning-free. [21]

See concluding remarks in the foundational paper. [5]

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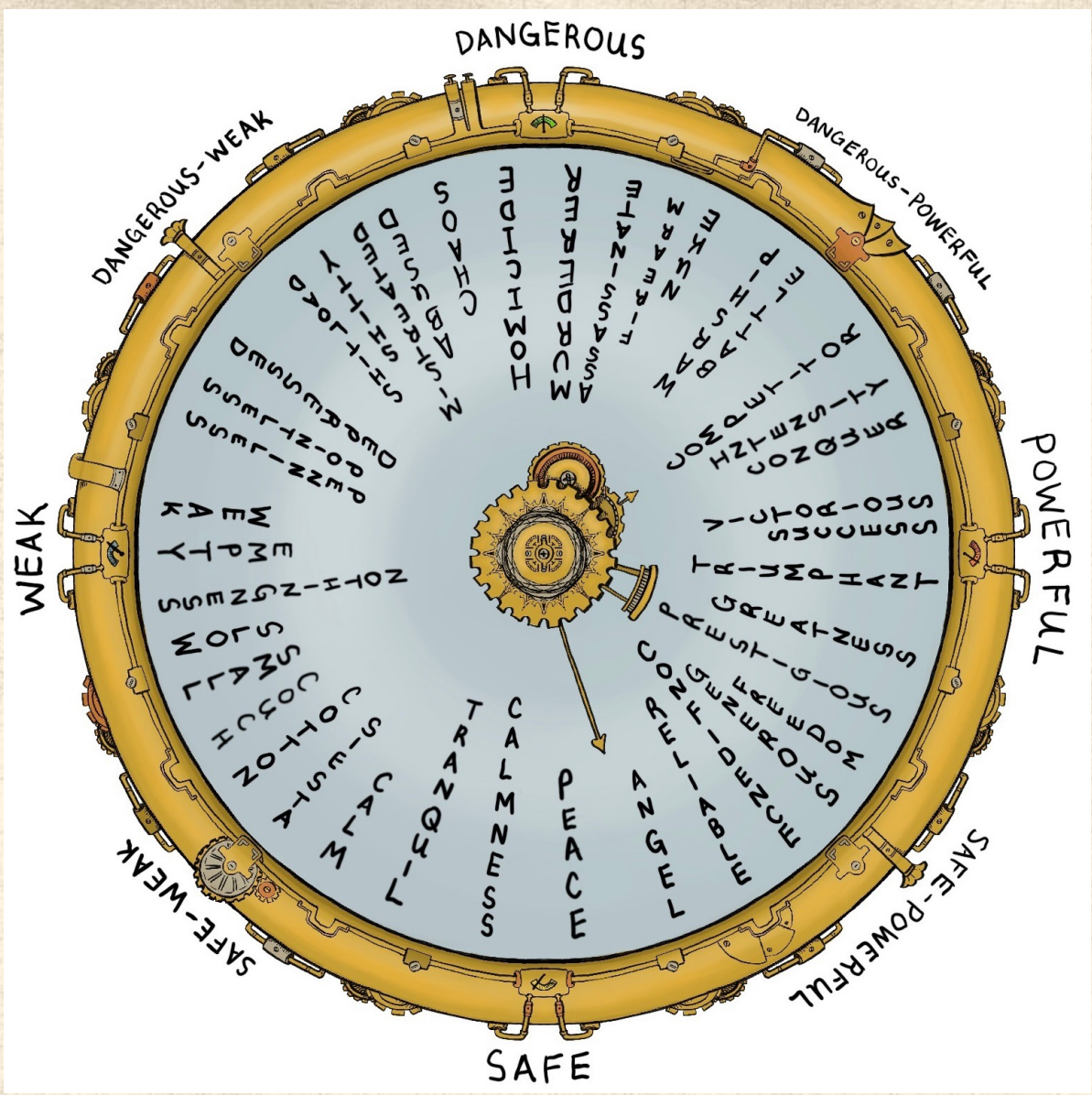

Online appendices: Paper(s), extra figures, flipbooks, code.

https://storylab.w3.uvm.edu/ousiometrics

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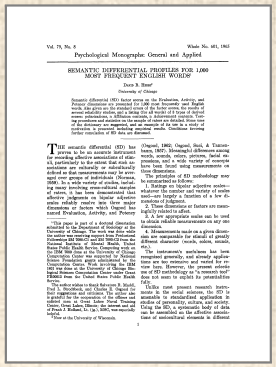
Synonyms	Valence	Arousal	Dominance	Goodness	Energy	Structure	Power	Danger	Structure
happy	0.50	0.24	0.27	0.53	0.26	0.18	0.57	-0.16	0.18
delighted	0.44	0.16	0.18	0.44	0.17	0.17	0.44	-0.18	0.17
excited	0.41	0.43	0.21	0.39	0.40	0.29	0.56	0.04	0.29
astonished	0.01	0.28	0.07	0.00	0.27	0.10	0.18	0.19	0.10
aroused	0.21	0.45	0.17	0.19	0.43	0.23	0.43	0.19	0.23
tense	-0.10	-0.06	0.15	-0.01	0.05	-0.19	0.03	0.04	-0.19
alarmed	-0.31	0.32	-0.01	-0.32	0.31	0.03	-0.03	0.45	0.03
angry	-0.38	0.33	0.10	-0.33	0.39	-0.07	0.02	0.51	-0.07
afraid	-0.49	0.28	-0.26	-0.59	0.17	0.09	-0.32	0.52	0.09
annoyed	-0.40	0.28	-0.16	-0.46	0.21	0.07	-0.19	0.47	0.07
distressed	-0.36	0.27	-0.18	-0.43	0.19	0.10	-0.19	0.43	0.10
frustrated	-0.42	0.15	-0.25	-0.50	0.06	0.05	-0.33	0.38	0.05
miserable	-0.44	-0.04	-0.31	-0.52	-0.13	-0.02	-0.47	0.26	-0.02
sad	-0.28	-0.17	-0.35	-0.38	-0.28	0.02	-0.47	0.05	0.02
gloomy	-0.39	-0.09	-0.21	-0.43	-0.13	-0.09	-0.40	0.20	-0.09
depressed	-0.48	-0.05	-0.36	-0.58	-0.17	-0.01	-0.54	0.27	-0.01
bored	-0.35	-0.33	-0.30	-0.40	-0.38	-0.14	-0.55	-0.02	-0.14
droopy	-0.06	-0.15	-0.20	-0.13	-0.22	0.03	-0.25	-0.08	0.03
tired	-0.38	-0.18	-0.31	-0.45	-0.26	-0.07	-0.50	0.11	-0.07
sleepy	0.10	-0.37	-0.25	0.03	-0.46	0.02	-0.29	-0.36	0.02
calm	0.37	-0.40	-0.22	0.28	-0.51	0.11	-0.14	-0.56	0.11
relaxed	0.36	-0.41	-0.12	0.32	-0.46	0.03	-0.08	-0.56	0.03
satisfied	0.46	0.01	0.18	0.48	0.04	0.10	0.38	-0.30	0.10
at ease	—	—	—	—	—	—	—	—	—
ease	0.30	-0.11	-0.01	0.27	-0.15	0.09	0.10	-0.29	0.09
content	0.26	-0.20	0.06	0.29	-0.18	-0.03	0.09	-0.33	-0.03
serene	0.30	-0.37	-0.13	0.25	-0.42	0.03	-0.10	-0.48	0.03
glad	0.44	0.26	0.24	0.45	0.27	0.19	0.52	-0.10	0.19
pleased	0.44	0.05	0.29	0.51	0.13	0.03	0.47	-0.25	0.03



Psychological Monographs: General and Applied

SEMANTIC DIFFERENTIAL PROFILES FOR 1,000 MOST FREQUENT ENGLISH WORDS

Dora R. Heise

University of Chicago

THE semantic differential (SD) has been shown to be an accurate instrument for measuring affect on connotative meaning, particularly to the extent that such connotations are culturally or subculturally shared. It has been demonstrated to be adequate across groups of individuals (Norman, 1958). In a wide variety of studies, factorial analyses of SD ratings have yielded three kinds of scales. It has been demonstrated that affective judgments on bipolar adjective scales reliably resolve into three major dimensions or factors which Osgood has named Evaluation, Activity, and Potency

"This paper is part of a doctoral dissertation submitted to the Department of Sociology, University of Chicago. The work was done while the author was a predoctoral trainee (Public Health Service Fellowship MH 9966-01 and MH 9966-02) supported by the National Institute of Mental Health, Public Health Service. Computing work was on IBM 7090 done at the University of Chicago Computation Center. Work involving the IBM 1620 was done at the Social Science Research Facility, Princeton University, with the assistance of the Computation Center. Work involving the IBM 7040 was done at the Social Science Research Facility, Harvard University, with the assistance of the IBM Computation Center, Cambridge, Massachusetts."

The author wishes to thank Edward E. Hunter, Neal L. Nicolaidis, and Charles E. Osgood for their suggestions and criticisms. The author also wishes to express appreciation to Mrs. Ann Ashford Jones for Grace Lobo, Frank Young, and Robert Bell for their assistance in the analysis of Study 2. Richard, Ltr. (ip), 1967, was especially

"Now at the University of Wisconsin.

(Osgood, 1962; Osgood, Suci, & Tannenbaum, 1957). Measuring[1] differences among words, sounds, colors, pictures, facial expressions, and a wide variety of concepts have been found using measurements on these three scales.

The principles of SD methodology may be summarized as follows:

1. A sample of relevant adjective scales—whatever the number and variety of scales used—are largely a function of a few dimensions of connotation.

2. These dimensions or factors are meaningfully related to affect.

3. Any concept or connotative scale can be used to obtain reliable measurements on any dimension.

4. Measurements made on a given dimension are comparable for stimuli of greatly different character (words, scales, stimuli, etc.).

The instrument's mechanism has been widely employed in its original form, and there are two extensive and varied bodies of review here. However, the present extended use of the technique in new areas does not seem to explain its potentialities fully.

Unless stated otherwise, the SD is shown to be a standardized instrument for the study of personality, culture, and society. Using the SD, a systematic body of data is presented which shows the connotative meanings of mathematical elements in different

“Semantic differential profiles for 1,000 most frequent English words.”

David R. Heise,
Psychological Monographs: General and Applied, **79**, 1, 1965. [6]

Dimension	Scale
Evaluation	Good-Bad
	Pleasant-Unpleasant
Activity	Active-Passive
	Lively-Still
Potency	Strong-Weak
	Tough-Tender
Stability	Rational-Emotional
	Tamed-Untamed

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Cur Psychol
DOI 10.1007/s12144-014-9219-4

Pleasure, Arousal, Dominance: Mehrabian and Russell revisited

Iris Bakker · Theo van der Voordt · Peter Vink · Jan de Boon

© Springer Science+Business Media New York 2014

Abstract This paper presents a discursive review of the dimensions pleasure, arousal and dominance that Mehrabian and Russell developed in 1974 to assess environmental perception, experience, and psychological responses. Since then numerous researchers applied these dimensions to assess the experience of the physical environment and its perceived qualities. Although the dimensions appeared to be useful, there is a long-lasting debate going on among environmental psychologists about the interpretation of pleasure, arousal and dominance and its underlying mechanisms. Due to the lack of clarity researchers use different adjectives to describe environmental experiences, which makes any comparison between research findings difficult. This paper shows that the three dimensions can be linked to the current ABC Model of Attitudes: pleasure, arousal and dominance can be respectively related to affective, cognitive and conative responses, i.e. Affect, Cognition and Behaviour (ABC). In addition, connecting the three dimensions to the triad feeling, thinking and acting, can also help to improve our understanding, interpretation and measurement of pleasure, arousal and dominance. Based on this review, it is proposed to re-introduce the three dimensions and to replace the nomadays often used two dimensional model with pleasure and arousal by a three dimensional model, including dominance as a third dimension, to represent the complete range of human responses.

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Published online: 11 June 2014 Springer

"Pleasure, arousal, dominance: Mehrabian and Russell revisited"
Bakker et al.,
Current Psychology, **33**, 405–421, 2014. [2]

- Test whether EPA and VAD match.
- Explore historical problems of defining end point descriptors for meaning dimensions.

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Ousiometrics and Telegnomics: The essence of meaning conforms to a two-dimensional powerful-weak and dangerous-safe framework

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