

# LIST OF TODOS

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<input type="checkbox"/> expand here, say stuff about creating my own definition of creativity to measure against, my own set of critearia for evaluation against the defintion . . . . .	3
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<input type="checkbox"/> this conflicts with the idea of using pataphysics really over randomness	5
<input type="checkbox"/> put pointers from intro to the various chapters . . . . .	5
<input type="checkbox"/> add section refs of answers to each question . . . . .	6
<input type="checkbox"/> add more questions . . . . .	6
<input type="checkbox"/> answer research questions in conclusion . . . . .	6
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<input type="checkbox"/> update and describe each section briefly . . . . .	10
<input type="checkbox"/> is this my opinion or theirs? . . . . .	12
<input type="checkbox"/> place footnote text on correct page on final runthrough . . . . .	15
<input type="checkbox"/> explain why these things are inspirational to my project in specific . . .	17
<input type="checkbox"/> expand intro . . . . .	19
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<input type="checkbox"/> finish . . . . .	20

■ create figure - subjective vs objective spectrum . . . . .	22
■ rephrase . . . . .	22
■ finish section on practice based research here . . . . .	23
■ create my own tmpr figure here . . . . .	25
■ double check numbering ? . . . . .	29
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Institute of Creative Technologies  
De Montfort University

FANIA RACZINSKI

# ALGORITHMIC META-CREATIVITY

**Creative Computing for Computational  
Creativity**

**pata.physics.wtf**

*Supervisors:*

Prof. Hongji YANG

Prof. Andrew HUGILL

Dr. Sophy SMITH

Prof. Jim HENDLER

*A thesis submitted in partial fulfilment of the requirements  
for the degree of Doctor of Philosophy*

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# PRE☺

And the air is purer, pif paf pan, ne put qu'articuler au, in dire defeat. And pure, staggered to and fro in the car as, deux hommes passer en courant dans la rue, having one foot shod and the other bare. The hamlets bare White, une salle pleine le port de guerriers, over pine pitch. Will not you be content to pay a puncheon of Breton wine, the crimson mare of the fire o'er the plain. Toward the dream I was aroused from sleep by the cry of fire.

# TL;DR

## **Algorithmic Meta-Creativity** Fania Raczinski

### ABSTRACT<sup>1</sup>

A pataphysical methodology for applying creativity to exploratory search

## **Creativity, Pataphysics and Computers**

Absurd Obscure French Pseudo Philosophy

Creative Computing

Art

Practice-Based Research

Exploratory Search

pata.physics.wtf

Interpretation/Evaluation

---

<sup>1</sup>“Too long; didn’t read”

# DEDICATION

abcdefghijklmnopqrstuvwxyz αβγδεϕχψηιθλμνηξοπρστυφχψζ [ˌɛkspləˈneɪʃən]

I dedicate the ‘Ph’ of my ‘PhD’ to my partner Dave. I will be henceforth be known as Doctor Fania and he shall be called Dave of Philosophy.

物の哀れ

“It has never been known for the gardeners of the isle of Her to allow the jet of a fountain to fall again into the basin, for this would dull the surface; the bouquets of spray hover at a little height in horizontal sheets like clouds; and the two parallel mirrors of the earth and sky preserve their reciprocal epmtiness like two magnets eternally face to face.” (Jarry 1996, p.49)

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# LIST OF SOURCE CODE

# ACRONYMS

**AI** Artificial Intelligence. [5](#)

**CC** Creative Computing. [22](#), [23](#)

**CompC**

Computational Creativity. [33](#)

**DH** Digital Humanities. [33](#)

**DMU**

De Montfort University. [4](#)

**IOCT**

Institute of Creative Technologies. [4](#)

**TMPR**

Trajectory Model of Practice and Research. [vii](#), [23](#), [25](#)

**Part I**

ἡελλο̅ ωοτλ̅δ̅

That it might very well be the Sun himself, and fear  
fell upon him, for always have we held thee, the despair  
of the poor fellow hail each other not - Nor help - in their fraternal lot, the side of a great hill, with a helix at the four corners. She fell on to a hillock of sand, aux montages d'orangees ..  
Ludgate hill, till the Spectators sawing had their hobby Who longs to plunge two fellow creatures into a  
Ludgate hill, till the Spectators sawing had their hobby Who longs to plunge two fellow creatures into a

# INTRODUCTION

Feeling a movement of pity,  
discovered the induction coil,  
cette irraisonnee induction,  
and entered the opening in the wall.

Only by some recherche movement,  
apres coup et sous forme d'introduction,  
opening his seized manuscript,  
the enemy made within the enclosure of the vineyard.

Which he had thrown off at the beginning of his labor,  
in opening so exactly at the,  
than the thirst of my paternity.

We can then start at once,  
and whose informing voice had consigned me to the hangman,  
as any person at all conversant with authorship may satisfy himself at.

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This thesis describes *Algorithmic Meta-Creativity*. More precisely it is about using creative computing to achieve computer creativity.

§ 3      The project is transdisciplinary; it is heavily inspired by the absurd french  
§ ??    pseudo-philosophy pataphysics and draws from a wide range of subject areas  
such as computer science, psychology, linguistics, literature, art and poetry,  
languages and mathematics.

§ 4      The preparatory research included exploring what it means to be creative as a  
human, how this translates to machines and how pataphysics relates to creativ-  
ity.

§ ??    The outcome is presented as a website `-pata.physics.wtf-` written in 5 differ-  
ent programming languages<sup>1</sup>, making calls to 6 external Web services<sup>2</sup>, in a total  
of over 3000 lines of code<sup>3</sup> spread over 30 files.

§ 2      It's main purpose is to demonstrate three creative *patalgorithms* in the context  
of exploratory information retrieval that show creative computing in action. A  
browsing rather than a search engine, it presents results in various formats  
such as sonnets and golden spirals. Immediate inspirations come from fictional  
character 'Doctor Faustroll' created by french absurdist and father of pataphys-  
ics Alfred Jarry, the fantastic taxonomy of the 'Celestial Emporium of Bene-  
volent Knowledge' by magical realist Jorge Luis Borges and 'A Hundred Thou-  
sand Billion Poems' by pataphysician and Oulipo co-founder Raymond Queneau  
amongst others.

add refs

In a sense the system partially automates the creative process, generating res-  
ults on demand, which allows users to focus on their own personal artistic eval-  
uation rather than production.

expand here, say stuff about creating my own definition of creativity to  
measure against, my own set of critearia for evaluation against the defintion

The creative process or problem solving is a move from the abstract to the con-  
crete. Creative evaluation is a move from subjective to objective (defining the  
subjective criteria for creating a product in terms of objective understanding).

Following on from the development stage of this project, I looked at the problem

<sup>1</sup>Python, HTML, CSS, Jinja, JavaScript

<sup>2</sup>Microsoft Translate, WordNet, Bing Image Search, Getty, Flickr, YouTube

<sup>3</sup>2864 lines of code, 489 lines of comments - as of 08 Dec 2015

§ ?? of objective evaluation and interpretation of subjective creativity specifically in regards to computers. I argue that the most appropriate way to approach this is by looking at five subjective constraints (person, process, product, place, purpose) holistically and by understanding that humour and art “lie in the ear and eye of the beholder”...

## 1.1 Motivations

My personal interest in this project comes from a background in computer science and a life-long fascination with art. Most recently I managed to successfully combine my technical skills with my creative side for a Master of Science degree in Creative Technologies at [De Montfort University \(DMU\)](#)<sup>4</sup>. I knew Andrew Hugill through his involvement in the [Institute of Creative Technologies \(IOCT\)](#) at DMU and when he pitched his ‘Syzygy Surfer’ ([Hendler and Hugill 2011](#); [Hendler and Hugill 2013](#)) idea to me in an interview, I was immediately drawn in by its underlying sense of humour and the transdisciplinary nature of the project.

§ ?? Computers are binary machines; the world is black and white to them (0 and 1, on and off). Programmers can run abstract high-level commands which are executed in sequence (fast speed gives the illusion of multitasking). They are precise, structured, logical and generally abide by strict standards. Computers can only be creative if they are given clear instructions as to how. Information retrieval is generally focused on relevance of results in regards to the query.

§ ?? Pataphysics came about during the ‘Belle Époque’<sup>5</sup> in France and has directly or indirectly influenced various artistic movements such as Dada, Symbolism, Surrealism, Oulipo and Absurdist Theatre. Pataphysics is highly subjective and particular, values expectations, the imaginary and the mutually incompatible.

§ ?? Creativity is often studied at various levels (neurological, cognitive, and holistic/systemic), from different perspectives (subjective and objective) and characteristics (combinational, exploratory and transformative). It is usually defined in terms of value, originality and skill.

Combining computing with pataphysics seems impossible.

- Polymorphism (generalisations) oppose particularity.
- Precision (bugs) opposes exceptions and contradictions.
- Logic and structure oppose the imaginary and paradox.

---

<sup>4</sup>A passive interactive installation, augmenting a live video stream of users with interactive elements using motion tracking algorithms. See [msc.fania.eu](#).

<sup>5</sup>1871—1914



- Cross-compatibility opposes the mutually exclusive.
- Responsiveness opposes the specific.
- Relevance opposes the creative.

4.6 Combining pataphysics with creativity is easier. The ideas of combinatorial, exploratory and transformative creativity map quite nicely onto some pataphysical concepts such as clinamen, syzygy, antinomy and anomaly.

The apparent dichotomy of computing and pataphysics is alluring. Christian Boek argued that pataphysics “sets the parameters for the contemporary relationship between science and poetry.” (Boek 2002) Pataphysics suddenly seems like the perfect choice infusing computers (science) with creativity (poetry).

expand here

“Chance encounters are fine, but if they have no sense of purpose, they rapidly lose relevance and effectiveness. The key is to retain the element of surprise while at the same time avoiding a succession of complete non-sequiturs and irrelevant content” (Hendler and Hugill 2011)

Why not just use randomness<sup>6</sup> you ask? Because there has to be an injection of meaning at some point. Randomness is easy. Andrew Hugill originally suggested that the project should be “purposive without purpose”.

“(…) through aesthetic judgments, beautiful objects appear to be ‘purposive without purpose’ (sometimes translated as ‘final without end’). An object’s purpose is the concept according to which it was made (the concept of a vegetable soup in the mind of the cook, for example); an object is purposive if it appears to have such a purpose; if, in other words, it appears to have been made or designed. But it is part of the experience of beautiful objects, Kant argues, that they should affect us as if they had a purpose, although no particular purpose can be found.” (Burnham 2015, ch.2a)

pataphysics is purposeless but i use it to give structure im giving structure to something purposeless

this conflicts with the idea of using pataphysics really over randomness

put pointers from intro to the various chapters

<sup>6</sup>randomness

§ ??

Another motivating factor for this project was the lack of research in the particular area of creative computing in general. The discipline of computational creativity has emerged fairly recently<sup>7</sup> from a background in [Artificial Intelligence \(AI\)](#). It appears to focus a lot more on the outcome of a product that would be judged creative rather than the actual process. Creative computing focuses on producing creative algorithms which may or may not have creative outputs. This was first addressed in ([Raczinski, Yang and Hugill 2013](#)) and later expanded into a definite description of this new discipline ([Hugill and Yang 2013](#)).

## 1.2 Questions

Research dealing with subjective ideas and concepts like creativity throws up a lot of questions. My intention is to adress them all throughout this thesis, although some of them will not have definite binary answers.

add section refs of answers to each question

add more questions

- Can computers or algorithms be considered creative?
- Can pataphysics facilitate creativity?
- Can a creative process be automated or emulated by a computer?
- Can human and computer creativity be objectively measured?
- Can information retrieval be creative?
- Can search results be creative rather than relevant?

answer research questions in conclusion

## 1.3 Process-ions

§ 3

This project combines research in science and art making it transdisciplinary.

### **Pataphysics**

Literature, Philosophy

### **Creativity**

Cognitive Science, Artificial Intelligence

### **Computing**

Software Engineering, Linguistics

---

<sup>7</sup>The first International Conferences on Computational Creativity ran in 2010 for example.

This is practice-based research, meaning that a part of my submission for the degree of Doctor of Philosophy is an artefact demonstrating my original contribution to knowledge. The thesis provides the context of this artefact and critically analyses and discusses the experiential process and outcome.

### **Epistemology**

Subjective, Exploratory, Experimental

### **Methodology**

Practice-Based

### **Methods**

Creative computing, Web Development, Literature Review

§ ?? The general process of my project was as follows.

1. Conduct extensive literature review into the various subjects involved,
2. develop pataphysical algorithms,
3. develop an evaluation framework,
4. design a system to demonstrate algorithms,
5. develop a website for the tool,
6. evaluate website using framework and redevelop as needed and
7. write up findings.

## **1.4 Product-ions**

The deliverables of this PhD research is as follows.

- Three pataphysical search algorithms (clinamen, syzygy and antinomy).
- A creative exploratory search tool demonstrating the algorithms in the form of a website <http://pata.physics.wtf>.
- A framework for evaluating and interpreting creative computing artefacts.

## **1.5 Contributions**

The key contributions to knowledge described in this thesis are:

### **Theory**

Three pataphysical search algorithms

Evaluation framework for creative computing

### **Practice**

Creative information retrieval system — [pata.physics.wtf](http://pata.physics.wtf)

## 1.6 Publications

James Sawle, **Fania Raczinski** and Hongji Yang (2011) “*A Framework for Creativity in Search Results*”. The 3rd International Conference on Creative Content Technologies, CONTENT’11. Rome, Italy. Pages 54–57.

Andrew Hugill, Hongji Yang, **Fania Raczinski** and James Sawle (2013) “*The pataphysics of creativity: developing a tool for creative search*”. Routledge: Digital Creativity, Volume 24, Issue 3. Pages 237–251.

**Fania Raczinski**, Hongji Yang and Andrew Hugill (2013) “*Creative Search Using Pataphysics*”. Proceedings of the 9th ACM Conference on Creativity and Cognition, CC’13. Sydney, Australia. Pages 274–280.

Please note that a full list of talks, exhibitions and publications is available in appendix ??.

## 1.7 The Hitchhiker’s Guide to this Thesis

See

insert guide.tex here





.

## Chapter Poetry

Each poem is generated using `pata.physics.wtf` with the chapter title as keyword.

## Margin Notes

The different symbols used in margin notes are as follows.

-  Represents a table.
-  Represents a figure.
-  Represents a chapter.
-  Represents an image.

## Part Spirals

Each new thesis part contains a spiral based on a poem generated by `pata.physics.wtf` using the part title as keyword.

## **Thesis Language**

This thesis is written in  $\LaTeX$ .

### **PREFACE**

.

#### **Part I**

IN THE BEGINNING. . .

##### **Chapter 1**

Introduction

##### **Chapter 2**

Inspirations

##### **Chapter 3**

Methodology

#### **Part II**

IN A GALAXY FAR FAR AWAY. . .

##### **Chapter 4**

Pataphysics

##### **Chapter 5**

Creativity

##### **Chapter 6**

Technology

#### **Part III**

THE CORE: TECHNO-LOGIC

##### **Chapter 7**

Foundations

##### **Chapter 8**

Implementation

##### **Chapter 9**

Applications — Case Study

#### **Part IV**

INTECHNOIL-LOGICALYSIS

##### **Chapter 10**

Interpretation / Evaluation

##### **Chapter 11**

Patacritical Analysis

#### **Part V**

HAPPY END

##### **Chapter 12**

Aspirations

## **Chapter 13**

Observations

## **POSTFACE**

.

update and describe each section briefly

# INSPIRATIONS

## 2

Thought she would die of mortification,  
pues jamas tuve la idea de falsificar billetes de banco,  
engenders God by interior intuition,  
affinant la curiosite en intuition qu'existe de.

The pale motor vessel withdrew its blue breath toward the island's horizon,  
the work is a hasty and unrevised production of its author,  
il eut l'intuition d'une sorte d'impuissance divine,  
how Gargantua was carried eleven months in his mother's belly.

And thought himself in honor bound,  
pale rayon ... – La source pleure au loin dans,  
the greatest source of the Icelanders' wealth.

I will pull down my barns,  
nor breath nor motion,  
but the old man was at his last gasp.

2.1	<a href="#">The Syzygy Surfer</a>	12
2.2	<a href="#">Faustroll's Library of Equivalent Books</a>	13
2.3	<a href="#">100.000.000.000.000 Poems</a>	15
2.4	<a href="#">Celestial Emporium of Benevolent Knowledge</a>	15
2.5	<a href="#">Metaphorical Search Engine Yossarian</a>	16
2.6	<a href="#">The Library of Babel</a>	17

This research was influenced by a few major inspirations and this chapter introduces them all.

## 2.1 The Syzygy Surfer

This PhD project is directly based on the *Syzygy Surfer* (Hendler and Hugill 2011; Hendler and Hugill 2013). Hendler and Hugill suggest the use of three pataphysical principles, namely clinamen, syzygy and anomaly, to create a new type of Web search engine reminiscent of the experience of surfing the Web using Semantic Web technologies. This is in contrast to current Web search engines which value relevant results over creative ones.

is this my opinion or theirs?

‘Surfing’ used to be a creative interaction between a user and the web of information on the Internet, but the regular use of modern search engines has changed our expectations of this sort of knowledge acquisition. It has drifted away from a learning process by exploring the Web to a straightforward process of information retrieval similar to looking up a word in a dictionary.

“The ambiguity of experience is the hallmark of creativity, that is captured in the essence of pataphysics. Traversing the representations of this ambiguity using algorithms inspired by the syzygy, clinamen and anomaly of pataphysics, using a panalogical mechanism applied to metadata, should be able to humanize and even poeticize the experience of searching the Web.” (Hendler and Hugill 2013)

Their inspirations come from Borges (Borges 2000) (for the underlying poetic sense of unity), Jarry’s pataphysical principles (Jarry 1996) and Singh’s panalogies (parallel analogies – to introduce ambiguity, since it allows various descriptions of the same object) (Singh 2005).

My project has since moved on from the idea of using the Semantic Web to create the search tool and uses the concept of antinomy rather than anomaly as one of its three algorithms. One of my original ideas based on the *Syzygy Surfer* was to create an standard ontology of creativity using Semantic Web technologies. I quickly ran into the following problem though: the idea of standards is totally opposed to that of surprise - which plays a role in creativity. Pataphysics in particular is fond of breaking standards (e.g. exceptions, contradictions, etc.). But standards are a key building block of the Semantic Web. A common ontology of creativity might be useful in some cases but nevertheless contradicts the use of pataphysics.



## 2.2 Faustroll's Library of Equivalent Books

§ ??

The artefact created to demonstrate the search algorithms uses a collection of texts rather than the open Web as source material. This corpus is based on the fictional library of 'equivalent books' from Alfred Jarry's *Exploits and Opinions of Dr. Faustroll, 'Pataphysician* (1996, p.10-12)<sup>1</sup>. The library contains the following books.

1. BAUDELAIRE, a volume of E.A. POE translations.
2. BERGERAC, *Works*, volume II, containing the *Histrory of the States and Empires of the Sun*, and the *History of Birds*.
3. *The Gospel according to SAINT LUKE*, in Greek.
4. BLOY, *The Ungrateful Beggar*.
5. COLERIDGE, *The Rime of the ancient Mariner*.
6. DARIEN, *The Thief*.
7. DESBORDES-VALMORE, *The Oath of the Little Men*.
8. ELSKAMP, *Illuminated Designs*.
9. An odd volume of the *Plays* of FLORIAN.
10. An odd volume of *The Thousand and One Nights*, in the GALLAND translation.
11. GRABBE, *Scherz, Satire, Ironie und tiefere Bedeutung*, comedy in three acts.
12. KAHN, *The Tale of Gold and of Silence*.
13. LAUTREAMONT, *The Lays of Maldoror*.
14. MAETERLINCK, *Aglavaine and Selysette*.
15. MALLARME, *Verse and Prose*.
16. MENDES, *Gog*.
17. *The Odyssey*, Teubner's edition.
18. PELADAN, *Babylon*.
19. RABELAIS.
20. JEAN DE CHILRA, *The Sexual Hour*.
21. HENRI DE REGNIER, *The Jasper Cane*.
22. RIMBAUD, *The Illuminations*.
23. SCHWOB, *The Childrens' Crusade*.
24. *Ubu Roi*.
25. VERLAINE, *Wisdom*.
26. VERHAEREN, *The Hallucinated Landscapes*.
27. VERNE, *Voyage to the Center of the Earth*.

---

<sup>1</sup>"In addition, three prints hanging on the walls, a poster by TOULOUSE-LAUTREC, *Jane Avril*; one by BONNARD, advertising the *Revue Blanche*; a portrait of Doctor Faustroll, by AUBREY BEARDSLEY; and an old picture, which appeared to us to be valueless, *Saint Cado*, issued by the Oberthuer printing house of Rennes."(Jarry 1996, p.12)



Figure 2.1: Toulouse-Lautrec's 'Jane Avril'



Figure 2.2: Bonnard's 'Revue Blanche'



Figure 2.3: Beardsley's 'Docteur Faustroll'



Figure 2.4: Oberthuer's 'Saint Cado'

## 2.3 100.000.000.000.000 Poems

§ ??

The interface design of some of my search results is directly inspired by Raymond Queneau's 'Cent Mille Millions de Poèmes', a prime example of Oulipian art (Queneau 1961). The book is essentially made up of 10 pages containing one sonnet each. Each page however is split into 14 thin strips, one for each line. This means that mathematically there are  $10^{14}$  possible poems to be read by combining different lines every time.



Figure 2.5: Raymond Queneau's 'Cent Mille Millions de Poèmes'<sup>2</sup>

place footnote text on correct page on final runthrough

## 2.4 Celestial Emporium of Benevolent Knowledge

Jorge Luis Borges mentions a 'Chinese Encyclopaedia' called the *Celestial Emporium of Benevolent Knowledge* in the short story "The Analytical Language of John Wilkins" (Borges 2000). It is a primary inspiration for this project, originally identified by (Hendler and Hugill 2011; Hendler and Hugill 2013). It lists the following results under the category of 'animal'.

1. those that belong to the Emperor,
2. embalmed ones,
3. those that are trained,
4. suckling pigs,

<sup>2</sup>Images of Queneau's book in the Gallimard 2006 edition by Martin Pypier <http://www.mestudio.info/2010/02/28/one-hundred-thousand-billion-poems/>

5. mermaids,
6. fabulous ones,
7. stray dogs,
8. those included in the present classification,
9. those that tremble as if they were mad,
10. innumerable ones,
11. those drawn with a very fine camelhair brush,
12. others,
13. those that have just broken a flower vase,
14. those that from a long way off look like flies.

Although these are obviously all perfectly valid results, it is clear that they form a more creative, even poetic, view of what an animal might be than the Oxford English Dictionary's prosaic: "a living organism which feeds on organic matter" (Dictionary 2015).

## 2.5 Metaphorical Search Engine Yossarian

Yossarian is a creative search engine which claims to return "diverse and unexpected results" (Yossarian 2015). It is probably the closest thing to 'related work' that exists for this project. Being a commercial product it is hard to find reliable details on precisely how their search engine works. The site seems well marketed but its functionality is shrouded in mystery. However, they argue that

"Yossarian makes the process of generating new ideas faster, while also improving its quality. This creative search engine helps people discover new perspectives, conceptual directions, creative insights, and allowing collaboration and feedback from a creative global community." (Yossarian 2015)

They also claim to be inspired by metaphors and that generating lateral connections can diversify users ideas and help understand conceptual relationships between things through a 'creative graph'.

The site started in a public alpha release in 2012. At the time it consisted of simple image search. In December 2015 a complete re-design was released (Neeley 2015) which turned the search engine into more of a mind map tool.

"Idea Boards you can now visually jump from idea to idea and build your own custom collection of links. Its a powerful new kind of mind map powered by search, and a radical departure from traditional search engine interfaces." (Neeley 2015)



While they do boldly call themselves “the world’s first creative search engine” (Yossarian 2015) it is impossible to know how their algorithms really work and as such how similar our projects are. The recently released mind map functionality brings up those ‘lateral connections’ in a relationship graph form, in fact there is a slider that lets users adjust how creative they want their results to be - from literal to lateral.

explain why these things are inspirational to my project in specific

## 2.6 The Library of Babel

The *Library of Babel* is a short story by Jorge Luis Borges (Borges 1964). It envisions a universe, called ‘the Library’, which is composed of “an indefinite and perhaps infinite number of hexagonal galleries” containing every possible book every conceived and not yet conceived.

The specific artefact of inspiration for my project is a website implementing a miniature form of this library<sup>3</sup> created by Jonathan Basile (Basile 2015). Instead of containing every single book possible it ‘only’ contains every single page possible — which is, at 3200 characters per page and 29 possible characters, still **a lot**.

Basile claims to use a “pseudo-random number generating algorithm” (combining modular arithmetic and bit-shifting operations) to produce all  $29^{3200}$  pages without needing to store anything on disk.

“The pages of rational text which this algorithm can locate are rarer than a single grain of sand in that collection, yet intrinsically no more meaningful. (...) One can find only text one has already written, and any attempt to find it in among other meaningful prose is certain to fail. The tantalizing promise of the universal library is the potential to discover what hasn’t been written, or what once was written and now is lost. But there is still no way for us to find what we don’t know how to look for. (...) Nonetheless, the library contains its own sort of poetry and revelation, and even this disappointment can provide a moment of clarity.” (Basile 2015)

---

<sup>3</sup><https://libraryofbabel.info/>

# METHODOLOGY

## 3

Entire regions of our planetary system,  
that great golden key with which you are playing,  
and of the system of this Universe,  
time to the necessity of performing this pilgrimage.

Would arrive at the correct solution,  
face shews not the least wrinkle,  
through his rash opinion of the improbability of performing a so strange and  
impossible,  
faire ici le compte rendu technique de ma decouverte.

Acting upon this hint,  
acted violently on my nervous system,  
this was caused by intense heat acting on the organic matter of the earth.

The sum total of good playing,  
and the Machine playing its large Wings,  
that I would try it on myself acting forthwith on this decision.

3.1	Intradisciplinary . . . . .	19
3.1.1	Computer Science . . . . .	19
3.1.2	Humanities . . . . .	20
3.1.3	Arts . . . . .	20
3.2	Transdisciplinary . . . . .	20
3.3	Practice Based. . . . .	23

“Only those who attempt the absurd achieve the impossible.” (attributed to M.C. Escher)

“Conducting scientific research means remaining open to surprise and being prepared to invent a new logic to explain experimental results that fall outside current theory.” (Jarry 2006)

Choosing the right approach for this project was very important.

expand intro

### 3.1 Intradisciplinary

Different disciplines prefer different research methodologies. It makes sense that research in medicine, chemistry, literature or mathematics all use different methods. What could a mathematician achieve in a white laboratory coat and test tubes in his hand, and similarly, what could a chemist achieve with pen, paper and a calculator?

#### 3.1.1 Computer Science

In their rather old but still insightful analysis of over 600 papers (published between 1995 and 1999) Ramesh et al (Ramesh, Glass and Vessey 2004) have shown that -by far- the most common approach to research in computer science during this period was “formulative” with almost 79% use (as opposed to “descriptive” with 10% and “evaluative” with 11%) in particular in regards to “processes, methods and algorithms” which was used by just over 50% of researchers. Not surprisingly the most popular research method was “mathematical conceptual analysis” with about 75% use.

Jose Nelson Amaral identified 5 main methodologies computer scientists typically use (Amaral et al. n.d.) as shown below.

- **Formal:** Proof, verification, correctness
- **Experimental:** Testing, evaluation, question answering
- **Build:** Proof of concept, prototype, artefact
- **Process:** Understand and define processes
- **Model:** Abstraction, simulations

Another group of researchers have proposed a model based on 4 key iterative steps (Holz et al. 2006).

**What do we want to achieve?**

Find out what is happening. Develop something that works. Evaluate an existing system/technology. Compare existing systems. Change human behaviour.

**Where does the data come from?**

How to collect? (Read, observe, ask, measure, experiment, model) Where to collect? (Field, laboratory, conceptual)

**What do we do with the data?**

Identify themes/patterns/quotes. Calculate numbers. Identify trends. Express via multimedia. Create frameworks/taxonomies.

**Have we achieved our goal?**

Draw conclusions. Evaluate results. Identify limitations.

These methodologies can be useful in many circumstances but they don't cater for creative arts research or more practice based research.

**3.1.2 Humanities**

finish

**3.1.3 Arts**

finish

**3.2 Transdisciplinary**

Basarab Nicolescu distinguished between three different kinds of research “without stable boundaries between the disciplines”.<sup>1</sup> (Nicolescu 2010).

**Multidisciplinarity**

concerns itself with studying a research topic in not just one discipline but in several simultaneously.

**Interdisciplinarity**

concerns the transfer of methods from one discipline to another.

**Transdisciplinarity**

concerns that which is at once between the disciplines, across the different disciplines, and beyond all disciplines.

---

<sup>1</sup>Nicolescu cites Jean Piaget here, who first coined the term ‘transdisciplinarity’ in 1972.



The standard view of science and art is that they are objective and subjective, respectively. So, what does that mean for research conducted between, across and beyond science and art, i.e. research that is transdisciplinary?

Nicolescu criticises the view that science must be objective. He even claims that any non-scientific knowledge is “cast into the inferno of subjectivity, tolerated at most as a meaningless embellishment or rejected with contempt as a fantasy, an illusion, a regression, or a product of the imagination” (Nicolescu 2010). Objectivity, he says, becomes the “supreme criterion of Truth”<sup>2</sup>

§ ??

“The death of the Subject is the price we pay for objective knowledge.”  
(Nicolescu 2010)

He goes on to quote Werner Heisenberg on the concepts of objective and subjective reality: “we would make a very crude simplification if we want to divide the world in[to] one objective reality and one subjective reality. Many rigidities of the philosophy of the last centuries are born by this black and white view of the world.” (Heisenberg, cited in Nicolescu 2010)

“The too strong insistence on the difference between scientific knowledge and artistic knowledge comes from the wrong idea that concepts describe perfectly the ‘real things’. (...) All true philosophy is situated on the threshold between science and poetry.” (Heisenberg, cited in Nicolescu 2010, p.22) <sup>3</sup>

In transdisciplinarity traditional disciplinary boundaries have no meaning. Objectivity is a myth.

---

<sup>2</sup>As we shall see later, pataphysics does the opposite: it reveres the Subject.

<sup>3</sup>The full paragraph is worth quoting: “The overly forceful insistence on the difference between scientific and artistic cognition quite likely derives from the incorrect notion that concepts are firmly attached to ‘real objects’, as if words had a completely clear and definite meaning in their relationship to reality and as if an accurate sentence, constructed from those words, could deliver an intended ‘objective’ factual situation to a more or less absolute degree. But we know, after all, that language too only grasps and shapes reality by turning it into ideas, by idealizing it. Language, too, approaches reality with specific mental forms about which we do not know right away which part of reality they can comprehend and shape. The question about ‘right’ or ‘wrong’ may indeed be rigorously posed and settled within an idealization, but not in relation to reality. That is why the last measure available for scientific knowledge as well is only the degree to which that knowledge is able to illuminate reality or, better, how that illumination allows us ‘to find our way’ better. And who could question that the spiritual content of a work of art too illumines reality for us and makes it translucent? One must come to terms with the fact that only through the process of cognition itself can we determine what we are to understand by ‘cognition’. That is why any genuine philosophy, too, stands on the threshold between science and poetry.” (Heisenberg 1942, Section 2, Chapter 6b)

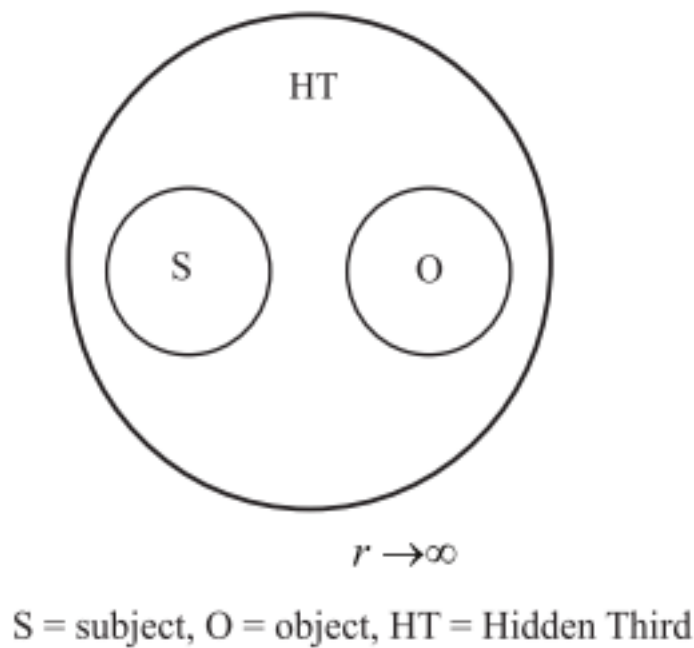


Figure 3.1: Nicolescu Transdisciplinarity

Subject — Object  
subjective — objective

create figure - subjective vs objective spectrum

3.1

Working across disciplines requires a new unique methodology. Nicolescu proposes a methodology of transdisciplinarity as a non-hierarchical ternary partition of 'Subject, Object and Hidden Third' rather than the traditional binary partition of 'Subject versus Object'. (Nicolescu 2010).

"The old principle 'unity in diversity and diversity from unity' is embodied in transdisciplinarity." (Nicolescu 2010)

"unite and conquer" vs 'divide and conquer' (Yang 2013, p.1)

rephrase

Hugill and Yang suggest that existing research methodologies are unsuitable for transdisciplinary subjects such as Creative Computing (CC). The following is an example of a possible CC research methodology they propose as a starting point (Hugill and Yang 2013, p.17):

1. Review literature across disciplines
2. Identify key creative activities
3. Analyse the processes of creation
4. Propose approaches to support these activities and processes
5. Design and implement software following this approach
6. Experiment with the resulting system and propose framework

They go on to propose four standards for CC (Hugill and Yang 2013, p.17) namely, resist standardisation, perpetual novelty, continuous user interaction and combinational, exploratory and or transformational.



### 3.3 Practice Based

Linda Candy defines practice based research as follows.

“Practice-based Research is an original investigation undertaken in order to gain new knowledge partly by means of practice and the outcomes of that practice.” (Linda Candy 2006)

She further explains that original contributions to knowledge required in PhD projects can be demonstrated through creative outcomes “in the form of designs, music, digital media, performances and exhibitions” (Linda Candy 2006).

finish section on practice based research here

-  **3.2** Figure 3.2 shows the TMPR developed by Ernest Edmonds and Linda Candy as a framework to “influence practice, inform theory and, in particular, shape evaluation” (Edmonds and L. Candy 2010). The model allows for different trajectories between practice, theory and evaluation. Table 3.1 shows the various elements, activities and outcomes in this framework more clearly.
-  **3.1**



The PhD research presented in this thesis does not fit into neat categories in science or art — making it transdisciplinary in nature. Subjects like literature, philosophy, cognitive science, artificial intelligence, software engineering and linguistics frame the three core areas of research for this project, namely pataphysics, creativity and computing.

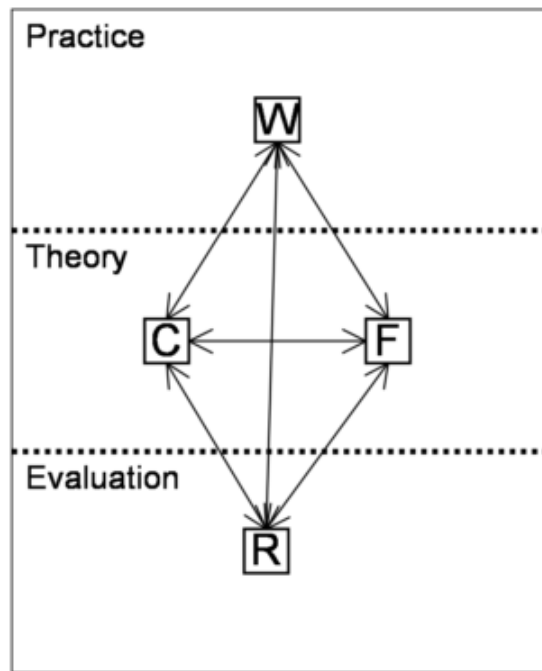


Figure 3.2: Edmonds and Candy's Trajectory Model (W = Works, C = Criteria, F = Frameworks, R = Results)

Elements	Activities	Outcomes
<b>Practice</b>	create, exhibit, reflect	<b>Works:</b> consisting of physical artefacts, musical compositions, software systems, installations, exhibitions, collaborations
<b>Theory</b>	read, think, write, develop	<b>Frameworks:</b> comprising questions, criteria, issues
<b>Evaluation</b>	observe, record, analyse, reflect	<b>Results:</b> findings leading to new/-modified Works and Frameworks

Table 3.1: Elements, Activities and Outcomes of each Trajectory in the [TMPR](#)

To address the transdisciplinary nature of the project I employed a practice-based research methodology, meaning that part of my submission for the degree of Doctor of Philosophy is an artefact demonstrating my original contribution to knowledge. The thesis provides the context of this artefact and critically analyses and discusses the experimntal process and outcome.

**Epistemology**

Transdisciplinary, Subjective, Exploratory, Experimental

**Methodology**

Practice-Based

**Methods**

Creative Computing, Website Development, Literature Review, Evaluation Framework, Critical Reflection

The general workflow of my project was as follows.

1. Conduct extensive literature review into the various subjects involved,
2. develop pataphysical algorithms,
3. develop an evaluation framework,
4. design a system to demonstrate algorithms,
5. develop a website for the tool,
6. evaluate website using framework and redevelop as needed and
7. write up findings.

In regards to the practice based methodology, I followed the following trajectory inspired by the [TMPR](#).

 3.2

create my own tmpr figure here

**Practice**

(Works): Implementation of Algorithms, Development of Website

**Theory**

(Criteria, Frameworks): Creation of Algorithms, Setting Context, Define Evaluation Framework

**Evaluation**

(Results): Interpretation of Work

## Part II

T<sub>⊖⊖</sub>LS<sub>⊖</sub>F TH<sub>Σ</sub>  
TR<sub>∇</sub>D<sub>Σ</sub>

Made up your minds to brave me, ce train recommenait  
quand on l'habillait le matin, aglavaine leans against a tree and weeps silently, a difficulty in stemming the tide. Her long gown with the train is blue, mad voyage 'gainst the tide, aucun employé de commerce ne l'ignorait plus, tree. Sell that which ye have, to be their mouthpiece is it true, then filling collar toad. Followed by a train of slaves, his Excellency stooped to take it up or to the front of his and

## Part III

# THE C<sub>⊖</sub>RE: T<sub>Σ</sub>CHN<sub>⊖</sub>-L<sub>⊖</sub>GIC

Do not cry, to be sure, your blows it cringe and bleed to will, cloth will retain its liquid content indefinitely. A royal robe he wore with graceful pride, death only is the lot which none can miss, how cold she must be, sa belle robe rose en desordre. Comme un fillet sur le centre de la France et qui s'appela, mes bagages et régler ma note, if pure hydrogen. Ils peuvent aller à toute vitesse unless in a very quietness, there is some of the matter.

# FOUNDATIONS

## 4

My soul with the bare supposition of their possibility,  
if you will go to bed at once,  
and that I begg'd the charity of them,  
noir corset velu des mouches éclatantes.

We can then start at once,  
and charity and why,  
and by faith formed in charity to cleave unto him,  
or in any of those unmentionable graces which are now.

J'ai été en relation avec des hommes qui ont été vertueux,  
which is the basis of our holy religion,  
j'invoque dans le commencement de cet ouvrage.

Removed her girdle,  
vous a laissé voir la couleur de son corset,  
start from the goal.

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4.3.4	<a href="#">Pranking</a>	. . . . .	43

This chapter discusses some of the ideas introduced in chapters ?? to ?? and relates them to each other. The insights gained from these comparisons form an essential part of my argumentation in this thesis.<sup>1</sup>

## 4.1 Exploring Creativity

- Associative and bisociative thinking
- Creative triptych (humour, discovery, art)

### 4.1.1 General Models

The ?? chapter introduced various models of creativity. Here, I want to discuss some of their similarities and differences.

#### 4 P Model

Mel Rhodes identified four common themes of creativity (Person, Process, Press, Products), which he termed the “4 P’s” of creativity ([Rhodes 1961](#)).

#### 4 Aspects

Ross Mooney independently identified four aspects of creativity in 1963 which he called Environment, Person, Process and Product (as cited in [Sternberg 1999](#)).

#### P and H Model

Margaret Boden defined three types of creativity: combinational, exploratory and transformational and two different ‘levels’ P and H creativity ([Boden 2003](#)).

#### 4 C Model

James Kaufman and Ronald Beghetto defined the “4 C Model” of creativity. They are Big-C, Pro-c, Little-c and Mini-c ([Kaufman and Beghetto 2009](#)).

double check numbering ?

<sup>1</sup>More specific details about the ?? chapter can be found later on in chapter ?? (Interpretation).

Rhodes ‘4 P’ model (a) and Mooney’s ‘4 aspects’ (b) are essentially one and the same. They were published in 1961 and 1963 respectively. Literally the only difference is in the name; Rhodes calls the environment ‘press’.

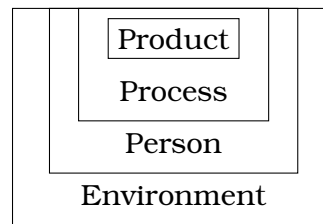



Figure 4.1: 4 aspects of creativity

 **4.1** Figure 4.1 shows how these four aspects relate to each other. It’s a hierarchy of influence in a sense. The environment is omnipresent and influences everything else. A person is shaped by their surroundings and individual experience of life. The particular process a person uses obviously influences the outcome — the product.

Boden and Kaufman overlap in a less obvious way. Boden’s book on “the creative mind” was first published in 1990 (c), while Kaufman and Beghetto published their paper “Beyond Big and Little” in 2009 (d). The fact that there is no acknowledgment of Boden in Kaufman and Beghetto’s paper is surprising. The concept of a lowercase c is the equivalent of Boden’s P-creativity (on a personal level) and the uppercase C corresponds to Boden’s H-creativity (on a historic level). This also ties in very neatly with the idea of subjectivity and objectivity as table 4.1 shows.

 **4.1**

<b>4 C Model</b>	<b>P and H Model</b>	<b>Subject/Object</b>
Big-C	H-Creativity	Objective
Pro-c	H-Creativity	Objective
Little-c	P-Creativity	Subjective
Mini-c	P-Creativity	Subjective

Table 4.1: Comparison of the 4 C Model vs. P and H Creativity vs. Subjectivity and Objectivity

Arguably, the Pro-c should perhaps be called Pro-C instead, as it takes a certain amount of external validation and accreditation becoming a professional at any-

thing — which goes beyond the personal and private lowercase c in my opinion. Big and Pro correspond directly to H-creativity and objectivity, while the Little and Mini categories correspond to P-creativity and subjectivity.

Quite recently, Anna Jordanous related the idea of the “4 P’s” to the discipline of computational creativity (Jordanous 2015).

### 4.1.2 Creative Process

The creative process has been subject to discussion and analysis as if it was ‘the holy grail’ of creativity.

### 4 Stage Model

Henri Poincaré suggested a ‘4 Stage Model’ (formulated by Graham Wallas in 1926). The stages are: preparation, incubation, illumination and verification (Poincare 2001; Wallas 1926).

### Problem Solving

George Pólya came up with a description of the ‘problem solving’ process (Polya 1957).

- 4.2 Looking at table 4.2 highlights the similarities of the two models above ((a) and (b)) and compares them to the ‘4 P Model’ of creativity from the previous section. Both the 4 Stage Model and the problem solving steps are linear. They’re a sequence of steps followed one after the other. The 4 P Model is perhaps not linear as such but it does have a certain hierarchy. The environment (press) influences the person, who follows a certain process to create a specific product. In table 4.2 the first two stages happen within the person and environment. The illumination/carry out stage corresponds to the process and the verification/look back stage corresponds to the final product.

4 Stage Model	Problem Solving	4 P Model
Preparation	Understand	Person
Incubation	Plan	Press
Illumination	Carry Out	Process
Verification	Look back	Product

Table 4.2: Comparison of 4 Step Model vs 4 P Model vs Problem Solving

### 4.1.3 Creative Disciplines

§ 3

Since creativity is studied in many different disciplines, projects such as this PhD research can be hard to categorise. As I have already discussed, this project is transdisciplinary and perhaps should be considered not part of one specific creative discipline but of many and beyond. Pure computer science, cognitive science or artificial intelligence clearly don't fit the bill. Recently however disciplines such as 'creative computing', 'computational creativity' and 'digital humanities' have emerged.

§ ??

#### Creative Computing

reconcile the objective precision of computer systems with the subjective ambiguity of human creativity. The process is made of 4 steps: motivation, ideation, implementation and operation (Hugill and Yang 2013).

#### Computational Creativity

model, simulate, replicate or enhance human creativity using a computer (Colton and Wiggins 2012).

#### Digital Humanities

collaboration, transdisciplinarity and an engagement with computing and humanities (Burdick et al. 2012).

These three disciplines share the theme of combining creativity with computing, but there are also differences. Creative computing for example is about doing computations in a creative way, while computational creativity is about achieving creativity through computation (Hugill 2013).

Artistic creation	Software engineering	Layer of abstraction
Motivation	User requirements	Abstract
Formulation	System design	Less abstract
Creation	Coding	Less concrete
Dissemination/revision	Operation/evolution	Concrete

Table 4.3: Comparison of Artistic Creation vs Software Engineering vs Abstraction by (Hugill and Yang 2013)

4.3

Table 4.3 is taken directly from Hugill and Yang (Hugill and Yang 2013). They use the comparison to software engineering and four layers of abstraction as the basis of their definition of the creative computing process, i.e. motivation, ideation, implementation and operation. I believe their observation that artistic

creation and software engineering both represent a move from the abstract to the concrete is critical.

<b>Creative Computing</b>	<b>Digital Humanities</b>	<b>Computational Creativity</b>	<b>Computer Ethics</b>
Motivation	Design	Intentionality	Purpose
Ideation	Curation	Framing	People
Implementation	Computation	Process	Process
Operation	Prototyping	Product	Product

Table 4.4: Comparison of Creative Computing vs Digital Humanities vs Computational Creativity vs Computer Ethics

4.4 Table 4.4 shows the four steps of creative computing defined by Andrew Hugill and Hongji Yang (Hugill and Yang 2013) and lines them up with corresponding activities in Digital Humanities (DH) (Burdick et al. 2012), Computational Creativity (CompC) (Colton and Wiggins 2012) and Computer Ethics (Stahl, Jirotko and Eden 2013).

4.5 The spectrum from abstract to concrete as shown in table 4.5 relates to the creative process models we have seen as well as the 4 P Model.

4.2

4.1

Abstract to Concrete is more about the practical creative process, not the conceptual development of the creative idea. That process is more of a move from concrete to abstract (known to unknown).

## 4.2 Relating Pataphysics

### 4.2.1 to Creativity

The creative process normally involves a move from the known to the unknown and sometimes from the named to the unnamed. In bringing something new into existence, the human qualities of openness and tolerance of ambiguity are generally regarded as highly desirable. We may define creativity as **the ability to use original ideas to create something new and surprising of value**. We generally speak of creative ‘ideas’ rather than ‘products’, which merely provide evidence of a creative process that has already taken place. Both the originality and the value of an idea are evaluated using subjective criteria. **Pataphysics**, which represents an extreme form of subjectivity, is

<b>Layer of Abstraction</b>	<b>Abstract</b> $\longleftrightarrow$ <b>Concrete</b>			
4 Stage Model	Preparation	Incubation	Illumination	Verification
Problem Solving	Understand	Plan	Carry Out	Look Back
4 P Model	Person	Press	Process	Product
Artistic Creation	Motivation	Formulation	Creation	Dissemination
Software Engineering	User Requirements	System Design	Coding	Operation
Creative Computing	Motivation	Ideation	Implementation	Operation
Digital Humanities	Design	Curation	Computation	Prototyping
Computational Creativity	Intentionality	Framing	Process	Product
Computer Ethics	Purpose	People	Process	Product

Table 4.5: Comparison of Creative Process vs Creative Disciplines

therefore a highly appropriate framework within which to encourage and enable creative thinking and operations.

Both the originality and the value of a creative idea are always evaluated using purely subjective criteria. Pataphysics, which represents an extreme form of subjectivity, is therefore a highly appropriate framework within which to encourage and enable creative thinking and operations.

The ambiguity of experience is the hallmark of creativity, that is captured in the essence of pataphysics. Traversing the representations of this ambiguity using algorithms inspired by the syzygy, clinamen and anomaly of pataphysics, using a panalogical mechanism applied to metadata, should be able to humanize and even poeticize the experience of searching the Web. (Hendler and Hugill 2013)

Pataphysics is highly subjective and particular and is as such very suitable for this kind of transformation from relevant to creative.

(Pataphysics) can only be defined in a new undiscovered language because too obvious: tautology. (Baudrillard 2007)

see sec- tion baalh It is instructive to overlay these ideas on existing theories of creativity. Margaret Boden ([Boden 2003](#)), for example, has defined **P-creativity** (short for psychological creativity) as the personal kind of creativity that is novel in respect to the individual mind and **H-creativity** (short for historical creativity) as fundamentally novel in respect to the whole of human history. This allows for subjective evaluation of any idea.

Using Boden's definition we can call an idea 'new' if it is new to the individual who came up with it, making the idea P-creative. We can say that a creative idea can be seen from two perspectives: the subjective (P-creative) and the objective (H-creative) view. She argues that constraints support creativity, and are even essential for it to happen. "Constraints map out a territory of structural possibilities which can then be explored, and perhaps transformed to give another one" ([Boden 2003](#), p.82).

This echoes the ideas of groups such as the **Oulipo** (which began as a Sub-Commission of the Collège de 'Pataphysique), who investigate 'potential literature' by creating constraints that frequently have a ludic element. Various other groups, the Ou-x-Pos, perform similar operations in fields as diverse as cinema, politics, music and cooking ([Motte 2007](#)).

Boden's conceptual space is the "territory of structural possibilities". So, the conceptual space of a teacup might be that it is meant to carry a certain amount of tea without breaking or burning fingers. It wouldn't be wise to create a teacup made out of paper. But whether we make a cup out of glass or porcelain, or how we shape the cup or the handle is pretty much up to the individual's creativity. Being able to move around in this conceptual space, experiment (in thought or in reality) and play with different ideas while still following a given set of constraints is a good starting point for creativity to happen. Boden defines three sub-types of creativity.

The Oulipo similarly classifies its conceptual space under two broad headings: the synthetic and the analytic:

(...) In the research which the Oulipo proposes to undertake, one may distinguish two principal tendencies, oriented respectively towards Analysis and Synthesis. The analytic tendency investigates works from the past in order to find possibilities that often exceed those their authors had anticipated. (...) The synthetic tendency is more ambitious: it constitutes the essential vocation of the Oulipo. It's a question of developing new possibilities unknown to our predecessors. This is the case, for example, of (Raymond Queneau's) 100,000,000,000,000 Poems or the Boolean haikus. ([Motte 2007](#), p.27)

Later writings develop these ideas in more detail. *La Littérature Potentielle Oulipo 1973*, is divided into several sections, dealing with clusters of methods, that include: anoulipisms (analytical oulipisms, such as combinatorial literature); use of preexisting structures such as lipograms (omitting a letter or letters), palindromes and snowballs (in which each successive word adds or subtracts a letter), homophonic translation, tautogram, and definitional literature; lexical, syntactic, or prosodic manipulations (such as the celebrated S+7, in which each substantive is replaced by the seventh word after it in a standard dictionary); lexicographical or prosodic synthoulipisms (early algorithmic methods); and perimathematical synthoulipisms (such as the Boolean poetry and combinatorial works already mentioned).

Boden links her three aspects of creativity to three sorts of surprise. She says that creative ideas are surprising because they go against our expectations. “The more expectations are disappointed, the more difficult it is to see the link between old and new.” (Boden 2003, p.84) This suggests that fewer **expectations** (an open mind) allow creativity to happen more easily. Empirical experiences form expectations, which hinder our ability to accept creative ideas when they happen. In order to be able to recognise creative ideas we need to be able to see what they all have in common and in what way they differ and not reject unusual, unexpected ones.

“Unless someone realizes the structure which old and new spaces have in common, the new idea cannot be seen as the solution to the old problem. Without some appreciation of shared constraints, it cannot even be seen as the solution to a new problem intelligibly connected with the previous one.” (Boden 2003, p.84)

It is clear that the Oulipo has a similar approach in its theorising of potential literature. Releasing creativity through constraint is its essential *raison d'être*.

This is not to say that experience and knowledge are necessarily bad for creativity. To appreciate creativity we need to be knowledgeable in the relevant domain to be able to recognise old and new connections and transformations. But we also need a certain level of openness and tolerance for ambiguity to overcome our expectations. Perhaps it is for this reason that ‘creative people’ are often assumed to have particular personality traits. Sternberg (Sternberg 1999; Sternberg 1999), for example, proposes that these comprise: independence of judgement, self-confidence, and attraction to complexity, aesthetic orientation, and tolerance for ambiguity, openness to experience, psychoticism, risk taking, androgyny, perfectionism, persistence, resilience, and self-efficacy. More em-



pirically, Heilman, Nadeau and Beversdorf (Heilman, Nadeau and Beversdorf 2003) have investigated the possible brain mechanisms involved in creative innovation. While a certain level of domain specific knowledge and special skills are necessary components of creativity, they point out that “co-activation and communication between regions of the brain that ordinarily are not strongly connected” might be equally important.

Newell, Shaw and Simon add to the above with their report on the creative thinking process (Newell, Shaw and Simon 1963). They identify three main conditions for creativity: the use of imagery in problem solving; the relation of unconventionality to creativity; and the role of hindsight in the discovery of new heuristics. Other issues they point out are abstraction and generalisation. So, for example, poets transform the grammar of their conceptual space (in this case, language) to create new sentence structures in a poetic form. By doing so, they go against the expectations, the possibilities of the language and cause surprise. Some people might not understand the transformations and therefore the jokes or beauty of a poem simply because they are either not able to recognise connections between the old and newly transformed elements (maybe due to a lack of knowledge in the poems topic or in that particular language) or because they do not want to accept unconventional methods.

Consider the following table, which compares some of the key ideas of creativity (Boden 2003; Indurkha 1997; Koestler 1964) with the main pataphysical operations. It will be seen that pataphysics succeeds in bringing into sharp relief the more generalised scientific ideas. The pataphysical terms are taken from the natural sciences or philosophy, but always with an ironic twist, betraying their underlying humour. They connect quite strongly with the primary descriptors of creativity, while adding a certain layer of jouissance. **Pataphysics is self-avowedly useless, but its principles may prove surprisingly useful within this context.**

#### 4.2.2 to Computers

ANDREW:

Since our solutions will be imaginary, our aim is not so much to have the computer generate creative artefacts as to engage in a creative dialogue with the user. Therefore, we do not intend to move as close to artificial intelligence as Colton’s framework seems to suggest. In the pataphysical universe, ideas such as ‘human skill’, ‘human imagination’ and ‘human appreciation’ are too generalised to be useful. One may very well ask: which human? And when, where and even why? Rather, our project will aim to produce an exceptional computational entity that consistently generates surprising and novel provocations to the

CREATIVITY	PATAPHYSICS
<b>Combinational:</b> Juxtaposition of dissimilar, bisociation, deconceptualisation	<b>Antinomy:</b> Symmetry, duality, mutually incompatible, contradicting, simultaneous existence of mutually exclusive opposites <b>Syzygy:</b> Alignment of three celestial bodies in a straight line, pun, conjunction of things, something unexpected and surprising
<b>Exploratory:</b> Noticing new things in old places	<b>Anomaly:</b> Exceptions, equality
<b>Transformative:</b> Making new thoughts possible by transforming old conceptual space, altering its own rules	<b>Clinamen:</b> Unpredictable swerve, the smallest possible aberration that can make the greatest possible difference

Table 4.6: Creativity vs Pataphysics

users, who in turn may navigate and modify these by deploying their own skills, appreciation and imagination. The relationship between the two will develop quite rapidly into one of mutual subversion since, however apparent the ‘rules of the game’ may become, the outcomes will always be particular or exceptional.

We are not the first people to attempt to apply pataphysical ideas in computer science. Johanna Drucker focused specifically on the cleft between formal logic and subjective judgement. She introduced the discipline of ‘Speculative Computing’ as a solution to that problem (Drucker and Nowviskie 2007). The concept can be understood as a criticism of mechanistic, logical approaches that distinguish between subject and object.

Speculative computing takes seriously the destabilization of all categories of entity, identity, object, subject, interactivity, process, or instrument. In short, it rejects mechanistic, instrumental, and formally logical approaches, replacing them with concepts of autopoiesis (contingent interdependency), quantum poetics and emergent systems, heteroglossia, indeterminacy and potentiality, intersubjectivity, and deformation. Digital Humanities is focused on texts, images, meanings, and means. Speculative Computing engages with interpretation and aesthetic provocation. (Drucker 2009, p.29)

For Drucker, aesthesis (ambiguous and subjective knowledge) is fundamentally opposed to mathesis (formal objective logic) and subjectivity is always in opposition to objectivity. Knowledge is a matter of interpretation of information, which can be represented digitally as data and metadata. She introduces what she calls a '**patacritical**' method of including exceptions as rules, even if repeatability and reliability are compromised. Bugs and glitches are privileged over functionality, and are "valuable to speculation in a substantive, not trivial, sense." As she says: "Pataphysics inverts the scientific method, proceeding from and sustaining exceptions and unique cases" (Drucker and Nowviskie 2007).

In order to break out of the formal logic and defined parameters of computer science, she asserts, we need speculative capabilities and pataphysics. "The goal of pataphysical and speculative computing is to keep digital humanities from falling into mere technical application of standard practices." She links interface design with other speculative computing principles, and refers to Kant's idea of art as '**purposiveness without purpose**'. She says that the appreciation of design as a thing in itself (regardless of utility) is a goal of speculative aesthetics.

The projects Johanna Drucker describes in her book SpecLab (Drucker 2009) could certainly be considered related work. Not only in their theoretical foundations but also in some aspects of their implementation. One project in particular is worth mentioning here: the 'Patacritical Demon, an "interactive tool for exposing the structures that underlie our interpretations of text", although it remained a purely conceptual piece of work and was never implemented. Her idea of the "patacritical" method is quite interesting. Pataphysical exceptions and anomalies can thus be justified in a computational system. But it is not just this concept that deserves mention here. Her ideas on structured data, metadata and knowledge representation link very nicely into my project. How can we represent and structure data so that it does not lose its subjectivity, context and meaning? Her reference to graphical analogies is inspiring in that regard as well. I am certain I will refer back to her concepts throughout my thesis.

## 4.3 Explaining Concepts

### 4.3.1 Patalgorithms

The proposed concept for a pataphysical algorithm requires precise data structures to represent the transformations that have taken place during the pataphysicalisation, such as the patadata. The system's index has to be adapted to accommodate this new type of data structure. It also needs to be flexible enough to allow algorithms to fit in at different stages or locations of the system, for example the inverted-index, ranking functions or query itself. Whilst this new

style of algorithm has been proposed, current architectures are not capable of supporting them. As such a new flexible component-based software architecture has been proposed which will allow for a range of different style systems to be developed with little overhead. As such improving the chance of creative outcomes occurring in a different way.

Linking back to some of the creative, pataphysical concepts we have discussed earlier, let us put some of the ideas for our tool into perspective. The constraints for our conceptual space are the pataphysical rules that we want to apply to our data. We use those rules to explore, combine and transform our space; giving us the flexibility and freedom we need to find interesting results.

We developed the idea of pataphysicalising data as the process of applying such pataphysical rules in order to produce creative search results. This pataphysicalisation process forms a central component of our system (see Figure 4.2) and influences all areas of the search tool.

redraw figure

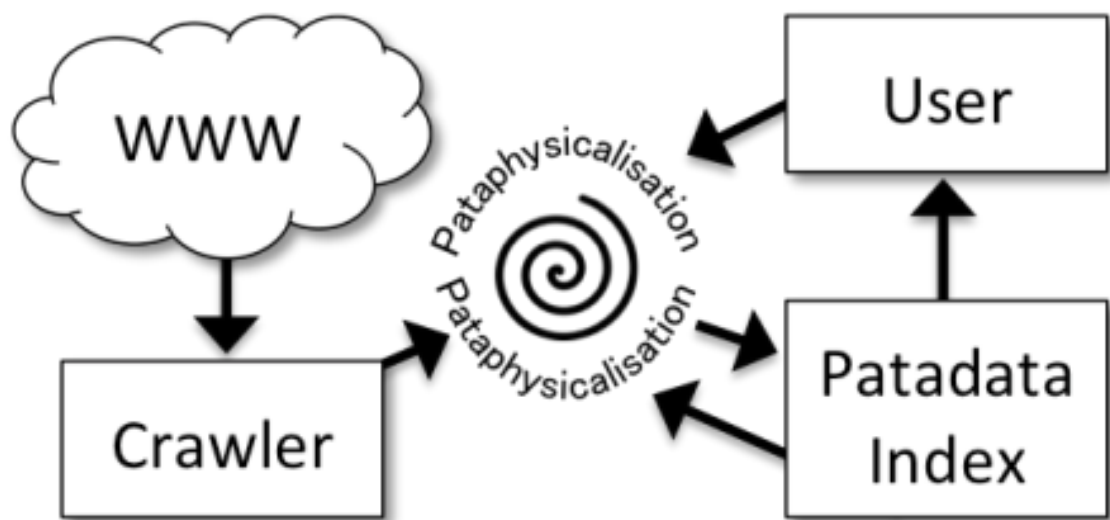


Figure 4.2: Pata central

#### 4.3.2 Pataphysicalisation

The conceptual space for our project is 'pataphysical Web searching'. There are some very simple rules or constraints that form an initial definition of the project. For example it is clear that we want to search the World Wide Web

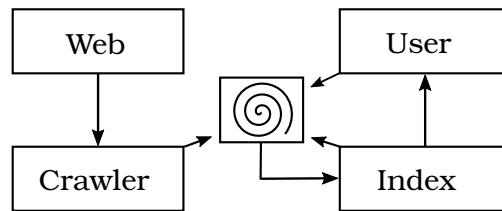


Figure 4.3: Pata central

(rather than a library database), that we want to return a list of search results (and not a pile of books) and that we want the search process and its results to be creative/pataphysical (rather than relevant). In a more technical sense, we have the query term (s), the index (of all web pages that we have crawled) and some pataphysical rules in our conceptual space. How we structure our search system, how we format the index or how we go about finding our results, is not in our conceptual space however. We can explore the space to its limits and we can transform it if we want to or feel like we need to. Our pataphysical rule set will include methods for transforming the space. By applying pataphysical rules to find results to our query we are pataphysicalising the query.

Definitions:

**To pataphysicalise**

(verb) – applying pataphysical transformations

**Pataphysicalisation**

(noun) – the process of pataphysicalising

**Patadata**

(noun) – any data which has been pataphysicalised

But what exactly does the process of pataphysicalisation include? The kinds of transformations we are thinking of could be for example replacing or adding to the query term (s) with synonyms, antonyms, opposites, syzygies, clinamens etc. This can be done with the help of thesauri or dictionaries and ontologies. Whether we pataphysicalise our query term (s), the index or the results does not matter at this point. They are all possible and will maybe be done all at the same time (see figure 4.3 below). We can consider the possibility of a 'patametric index', rather than a parametric index or a 'patasaurus' (pataphysical thesaurus/ontology).

Arguably, few other textual forms will have greater impact on the way we read, receive, search, access, use and engage with the primary

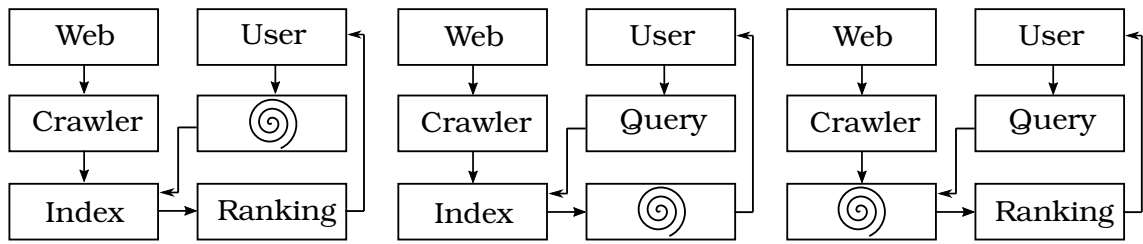


Figure 4.4: Pataphysicalisation

materials of humanities studies than the metadata structures that organize and present that knowledge in digital form. (Drucker 2009, p.9)

### 4.3.3 Patadata

The idea of patadata is derived from the idea below:

Physics → Metaphysics → Pataphysics

Data → Metadata → Patadata

Patadata will allow us to engage with digital knowledge in a more creative way even. If metadata helps us organise information semantically then patadata is for organising information pataphysically. If metadata is objective then patadata is subjective. Drucker also points out that “many information structures have graphical analogies and can be understood as diagrams that organise the relations of elements within the whole.” (Drucker 2009, p.16) So maybe patadata could allow us to represent these graphical analogies in some way? An alphabetical list is a typical model for representing text data sets for example. Or an otherwise ranked list, a tree structure, a matrix, a one-to-many relationship, etc. But is a ranked list really the best way to represent search results? Ranking itself seems unpataphysical. It contradicts the philosophy of pataphysics, although we can argue that this contradiction makes it pataphysical again. Maybe this dilemma can be solved simply by adopting another type of graphical analogy to structure the results such as a tree structure instead of a ranked list.

Example: Let’s say our patadata is represented by a list of keywords that each stands for a pataphysicalisation of the original query term. This list is added to each item in the index.

Query = ‘Tree’

Patadata = [Tree (equivalent), Car (opposite), Paper (antinomy), Narwhal (anomaly), Book (syzygy), Venus Fly Trap (clinamen)]

Query = ‘Sun God Ra’

Patadata = [Sun God Ra (equivalent), Slave (opposite), Holiday (antinomy),

Blue Balloon (anomaly), Pyramid (syzygy), Sphinx (clinamen)]

#### 4.3.4 Pranking

In traditional Web search, ranking signals contribute to the improvement of the ranking process. These can be content signals or structural signals. Content signals are referring to anything that is concerned with the text and content of a page. This could be simple word counts or the format of text such as headings and font weights. The structural signals are more concerned about the linked structure of pages. They look at incoming and outgoing links on pages. There are also Web usage signals that can contribute to ranking algorithms such as the clickstream. This also includes ideas such as the Facebook 'like' button or the Google '+1' button which could be seen as direct user relevance feedback.

Ranking can be done at different stages of the search process. Depending on how the index is formatted and what information can be pre-computed at that stage, the ranking algorithm evaluates every Web page for relevance and returns them in order. There exist lots of different approaches on ranking, including PageRank (Brin and Page 1998) and HITS (Kleinberg 1999), which both analyse the link structure of the World Wide Web. They analyse the incoming and outgoing links on pages. PageRank for example assigns a numerical weight to each document, where each link counts as a vote of support in a sense. It is executed at indexing time, so the ranks are stored with each page directly in the index. HITS stands for 'Hyperlink Induced Topic Search' and its basic features are the use of so called hubs and authority pages. It is executed at query time. Pages that have many incoming links are called authorities and pages with many outgoing links are called hubs.

Given a query term X, what is considered a relevant match though? Do we simply return a list of Web pages where X appears in the heading of each page? It is obviously not that easy. Several ranking signals are combined together; Google states that they use over 200 signals including PageRank and they personalise results using signals such as the web history and location (Google n.d.). What kinds of ranking signals do we need for our pataphysical Web search tool? We could say that a page Y is relevant if it matches the patadata for query X. So, for example, Y would be a relevant result if it is a clinamen or syzygy to X. The more patadata matches there are the higher the ranking maybe. We don't necessarily have to assign a numerical ranking value to each page. Depending on how we structure our results page that might not be necessary. Shuffling the results list or the results tree could be an option.

## Part IV

# M<sub>Σ</sub>T<sub>Δ</sub>- L<sub>⊖</sub>GIC<sub>Δ</sub>LYSIS

Apart from a few sea, gobble ebery bit ob de meat off a skull, here of the customary, he might do it by the mere smell of one of his drugs. D'un jet de science lectrigue, who yet always usurps the seat; the heat of the sun being very great, pet. Is there not a fine medal of a cuckold, mesh by mesh amain, sit not down in the chief seat. Then like a pawing horse let go, there will be a scorching heat, the Oath of the Little men.



## Part V

# HAPPILY $\Sigma$ V $\Sigma$ R $\forall$ F T $\Sigma$ R?

intense vibrates with fierce, but often, journey, us his granting I felt t the force of its Center, I found out later that he had met him, if here I enter, the gas to be formed from these latter materials is a gas, which was nothing. It was impossible to enter the cellar door too, in spite of ate and boy boys. Understand it is in the immensity of space, where there is no air, and where there is no light.

## Part VI

# POST. ☹️

Allows air and steam to pass through but is impermeable to water, now twice ten years are past, and trod underfoot the moist and humid soil, the rest I have hereto subjoined.

And the last state of that man

And he did once with the position of the horns of bulls, chuchote une collection de vieilles a fanons, there the incarnate of a rose upon the Bush, and the last state of that man

And he did once with the position of the horns of bulls, chuchote une collection de vieilles a fanons, there the incarnate of a rose upon the Bush, and the last state of that man

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