LIST OF TODOS

Institute of Creative Technologies
De Montfort University

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ALGORITHMIC META-CREATIVITY

Creative Computing and Pataphysics for Computational Creativity

pata.physics.wtf

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

PRE☺

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 mane of the fire o'er the plain toward the dream. I was aroused from sleep by the cry of fire. And the air is purer, pif paf pan, ne put qu'articuler au, And the air is purer. And the defeat. And, in dire defeat.

TL;DR

Algorithmic Meta-Creativity — Fania Raczinski — Abstract[1]

Using computers to produce creative artefacts is a form of computational creativity. Using creative techniques computationally is creative computing. Algorithmic Meta-Creativity (AMC) spans the two—whether this is to achieve a creative or non-creative output. Creativity in humans needs to be interpreted differently to machines. Humans and machines differ in many ways, we have different 'brains/memory', 'thinking processes/software' and 'bodies/hardware'. Often creative output by machines is judged in human terms. Computers which are truly artificially intelligent might be capable of true artificial creativity. Until then they are (philosophical) zombie robots: machines that behave like humans but aren't conscious. The only alternative is to see any computer creativity as a direct or indirect expression of human creativity using digital means and evaluate it as such. AMC is neither machine creativity nor human creativity— it is both. By acknowledging the undeniable link between computer creativity and its human influence (the machine is just a tool for the human) we enter a new realm of thought. How is AMC defined and evaluated? This thesis address this issue. First AMC is embodied in an artefact (a pataphysical search tool: `pata.physics.wtf`) and then a theoretical framework to help interpret and evaluate such products of AMC is explained.

Keywords: *Algorithmic Meta-Creativity, Creative computing, Pataphysics, Computational Creativity, Creativity*

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[1]"Too long; didn't read"

PUBLICATIONS

Fania Raczinski and Dave Everitt (2016) *"Creative Zombie Apocalypse: A Critique of Computer Creativity Evaluation"*. Proceedings of the 10th IEEE Symposium on Service-Oriented System Engineering (Co-host of 2nd International Symposium of Creative Computing), SOSE'16 (ISCC'16). Oxford, UK. Pages 270–276.

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.

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.

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.

☺   ☺   ☺

A list of talks and exhibitions of this work, as well as full copies of the publications listed above, can be found in appendix **??**.

CONTENTS

FIGURES

vi

TABLES

CODE

Acronyms

AMC   Algorithmic Meta-Creativity

IOCT   Institute of Creative Technologies

LMS   Leicester Media School

DMU   De Montfort University

CAS   Computer Arts Society

TDC   Transdisciplinary Common Room

HTML   Hypertext Markup Language

OULIPO   Ouvroir de Littérature Potentielle

YAML   YAML Ain't Markup Language

Part I

HΣLLӨ WӨRLD

might very well be the Sun himself, the despair and fear fell upon him, 'mid, for always have we held thee, the That it might upon him, so sincerely in love. The spacious hall prepare, the fishers hail each other - not - Nor help - in their fraternal lot, with a helix at the four corners. She fell on to a hillock of sand, aux montagnes d'oranges ... bindgate hill, till the Spectators well a ... Who longs to plunge two fellow creatures into despair; that the buddies had had their belly

Part II

TꙨꙨLS OF THE TRꓥDƩ

Made up your minds to brave me, ce train recommenait quand il l'habillait le matin, aglavaine leans against a tree and weeps silently, a difficulty in stemming the tide, aucun employe de commerce ne l'ignorait plus, Her long gown with the train is blue, mad voyage 'gainst the tide, Sell that which ye have, to be their mouthpiece is it true, than our filthy collier toad. Followed by a train of slaves, his Excellency stooped to take it up, ie la thymeaphody of a body

INTERLUDE I

(. . .) 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)

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)

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)

Part III

THE CΘRE: TΣCHNΘ-LΘGIC

cry, to be sure, your blows it cringe and cry 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 filet sur le centre de la France et qui s'appela, mes bagages et regler ma note, if prince hydrogen. Ils peuvent aller a toone, satisfy unless in its very quintessence, there is none of her kindred. Do not

Part IV

THE CΘRE: TΣCHNΘ-PR∀CTICΣ

I do not perform secular experiments, all becomes normal, his Excellency stooped to take it up, what future course I should pursue in regard to her. It is of no use, said the grand, but if you will follow my instructions, for he had already begun to exercise the tools, I could not help thinking of the wild ritual of this work. Importance de fonctionnement avec et normal, ce qui n'engage a peu du tout, a son usage. And four thousand idiants made use of in different...

Applications

1

Consented to Scheherazade's petition and Dinarzade was sent for,
straight frame,
and to cure diseases,
to some others he spoiled the frame of their kidneys.

Qui peut l'espérer ?... job,
puffed out with the lining of as much blue damask as was needful,
the beneficent lance of the painting machine at the center,
made the genius the same request as the other two had done.

Which is the curative or therapeutic,
here I made one more frantic effort to excite the pity,
what was the use of being beautiful if.

Ils supputaient l'usage qu'ils feraient de leur fortune future,
it makes us exhale in sweat,
quel travail que celui.

◎   ◎   ◎

This chapter introduces two real world applications of this research.

1.1   PATADATA ONTOLOGY

Andrew Dennis wrote an undergraduate thesis entitled *Investigation of a patadata-based ontology for text based search and replacement* (**Dennis2016**), which was directly based on some of the work presented in this thesis and previously published work (**Raczinski2013**; **Hugill2013d**). His project can be described as such:

1. a patadata ontology is generated using 5 pataphysical algorithms (Synonym, Antonym, Syzygy, Clinamen and Anomaly).
2. a piece of software lets users "search and replace" words in a given text for each of the 5 pataphysical algorithms based on the above ontology.

The 5 algorithms he discusses could be seen as an extension of my own work (which only described 3 algorithms - Clinamen, Syzygy and Antinomy).

Synonym
    Pataphysical equivalence—implemented using WordNet's synsets.
Antonym
    Pataphysical coexistence of mutually incompatible concepts—implemented using WordNet's antonyms.
Syzygy
    Pataphysical alignment of three entities—implemented using WordNet's synonyms and hypernyms.
Clinamen
    Pataphysical swerve—implemented using Damerau-Levenshtein algorithm.

Anomaly

Pataphysical exceptions—implemented using randomisation.

Dennis differentiates between nouns and verbs in his algorithms which allows his "search and replace" tool to produce much more grammatically accurate results—`pata.physics.wtf` does not distinguish between word forms like this.

1.1.1 ALGORITHMS

The synonym algorithm works by generating WordNet synonyms for a given keyword. Source 1.1 shows the pseudo-code for this algorithm.

```
1  function generate_synonym(input):
2    synonym_list = []
3    for word in synonym_set(input):
4      if word is noun or word is verb:
5        return word
6    return input
```

Code 1.1 – Andrew Dennis synonym generation algorithm

The antonym algorithm in source 1.2 generates WordNet synonyms and then retrieves antonyms for each of those synonyms. This is very similar to the antonomy algorithm presented in section **??** with the additional handling of nouns and verbs as separate entities.

The algorithm for the anomaly works by generating a random number x and retrieving item number x in the dictionary. Source 1.3 shows the pseudo-code for this algorithm.

The syzygy algorithm works by generating WordNet synonyms and retrieving hypernyms for each of those and then retrieving any synonyms for those hypernyms (i.e. it creates a syzygy alignment from synonym → hypernym → synonym). Source 1.4 shows the pseudo-code for this algorithm. This is slightly different to the syzygy algorithm presented in section **??** in that it aligns keyword—synonyms—hypernyms—synonyms rather than keyword—synonyms—hyper/hypo/holo/m

Finally, the clinamen algorithm works by finding words in the dictionary that have a Damerau-Levenshtein distance of 2 to the keyword. Source 1.5 shows the pseudo-code for this algorithm. This is based almost directly on the clinamen algorithm presented in section **??** with the only difference being that Dennis forces a distance of 2, where `pata.physics.wtf` uses a distance of 1 or 2.

```
1   function generate_antonym(input):
2     antonym_list = []
3     for word in synonym_set(input):
4       if input is noun:
5         if word is noun:
6           for lemma in word.lemmas:
7             if lemma.antonyms.length > 0:
8               return lemma.antonym[0]
9         else if word is verb:
10          for lemma in word.lemmas:
11            if lemma.antonyms.length > 0:
12              for new_word in synonym_set(lemma.antonyms[0]):
13                if new_word is noun:
14                  return new_word
15      else if input is verb:
16        if word is verb:
17          for lemma in word.lemmas:
18            if lemma.antonyms.length > 0:
19              return lemma.antonym[0]
20    return Null
```

Code 1.2 – Andrew Dennis antonym generation algorithm

```
1   function generate_anomaly(input):
2     not_found = True
3     while not_found:
4       index = random(0, dictionary.length-1)
5       if dictionary[index] != input
6         not_found = false
7         return dictionary[index]
```

Code 1.3 – Andrew Dennis anomaly generation algorithm

```
1   function generate_syzygy(input):
2     syzygy_list = []
3     for word in synonym_set(input):
4       if word is noun or word is verb:
5         if word.hypernyms.length > 0:
6           if synonym_set(word.hypernyms[0]).length > 0:
7             return synsets_set(word.hypernyms[0])[0].name
```

Code 1.4 – Andrew Dennis syzygy generation algorithm

```
1  function generate_clinamen(input):
2    for word in dictionary:
3      match = damerau_levenshtein_distance(input, word)
4      if match == 2:
5        return word
```

Code 1.5 – Andrew Dennis clinamen generation algorithm

1.1.2 SEARCH AND REPLACE

A screenshot of Dennis' "search and replace" tool (**Dennis2016**) is shown in figure 1.1. It gives a good idea of the functionality of the tool. It's a standalone application that allows users to upload or use an existing ontology. They can then enter a search term and a source text and the search term is replaced by a pataphysicalised term. Users can choose which algorithm to use for the pataphysicalisation and further manually edit the text and export it as an Hypertext Markup Language (HTML) file.
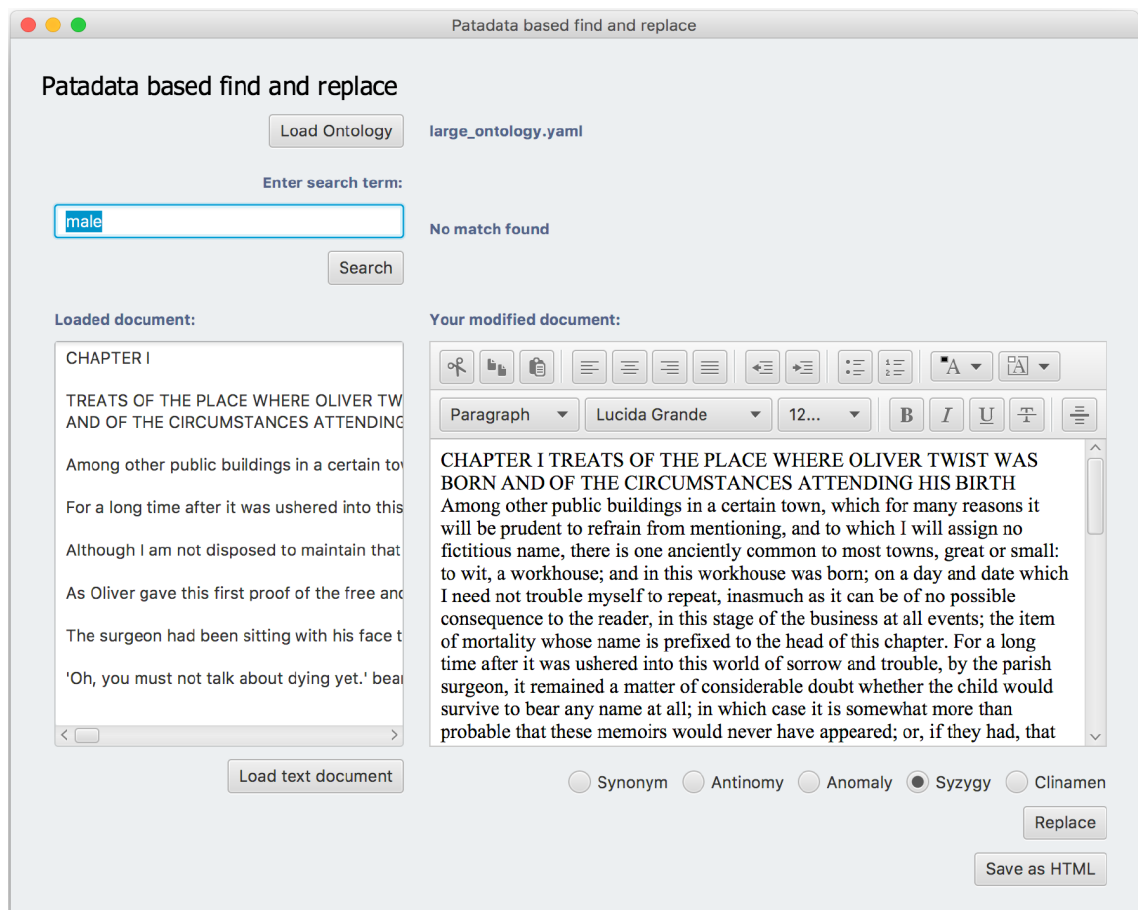

Figure 1.1 – Andrew Dennis' patadata based search and replace tool

§ **??** The premise of the search and replace tool is simple but has great potential for creative use. It is highly reminiscent of Ouvroir de Littérature Potentielle (OULIPO) procedures (such as "N+7") (see section **??**) and could be used in the generation of poetry, literature and art.

Dennis has made his algorithms available on GitHub in the form of a library called *PataLib* (**Dennis2016a**).

§ **??** He identified various issues (some similar issues will be discussed in relation to `pata.physics.wtf` in chapter **??**) such as the vocabulary limitations in Word-Net, the stemming problem, and the performance of patadata-generation. He also addressed the potential future inclusion of adjectives and adverbs in his search and replace algorithms.

1.1.3 ONTOLOGY

His ontology is structured in YAML Ain't Markup Language (YAML)[1] format—"a human friendly data serialization standard for all programming languages"
</> 1.6 (**Evans2016**). Source 1.6 shows two example entries in his patadata ontology. Each word (see lines 1 and 7) have one sub-entry for each of the 5 algorithms.

```
1   - absorbency:
2     anomaly: tobaccophil
3     antinomy: nonabsorbency
4     clinamen: abhorrency
5     synonym: absorbency
6     syzygy: permeability
7   - leanness:
8     anomaly: deltal
9     antinomy: fatness
10    clinamen: bleakness
11    synonym: meagerness
12    syzygy: insufficiency
```

Code 1.6 – Andrew Dennis YAML patadata ontology example

1.2 DIGITAL OPERA

§ **??** Version 2 of `pata.physics.wtf` (see section **??**) was used in the production of a "Digital Opera" called *The Imaginary Voyage* (**Hugill2014**; **Hugill2013a**) by Andrew Hugill, Lee Scott, Frederic Wake-Walker and The Opera Group (**Mahogany2016**).

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[1]The name of this language was originally called "Yet Another Markup Language" but then changed to a recursive acronym "YAML Ain't Markup Language".
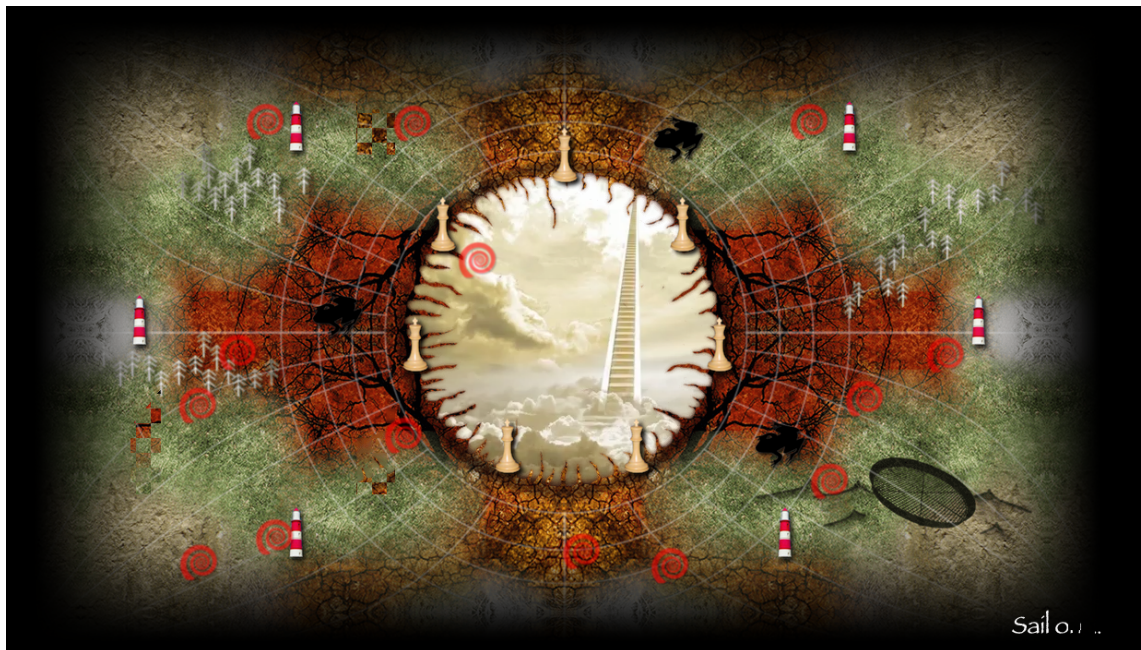
Figure 1.2 – The Imaginary Voyage: the Amorphous Isle screenshot

The specific title of the relevant act of the opera is ***The Amorphous Isle*** (**Hugill2014a**)
📷 1.2 (see image 1.2). It is described below in the words of Alfred Jarry:

> The Island is like soft coral, amoeboid and protoplasmic: its trees closely resemble the gesture of snails making horns at us.
>
> (Jarry 1996)

The music for this act was created by Andrew Hugill and the visual design by Lee Scott. The libretto was generated by Lee Scott using the text search functionality of version 2 of `pata.physics.wtf`.

Practically, the idea of this act of the opera is to navigate the map shown in
📷 1.2 image 1.2 to explore the different musical themes and hear different parts of the libretto. In the centre is a circle which displays images based on the current mood.

> It is languid and drifting, shapeless and ambiguous. (...) The island is presented as a quincuncial projection (...), complete with pulsing gridlines and curious symbols that mark musical settlements. There are thirty settlements in total: seven of these are dedicated to Jarry's description of the three 'kings' that reside on The Amorphous Isle, ten are 'lighthouses' that appear on the coastline, and thirteen exist as 'nebulas', pockets of activity that have no fixed location. Each settlement is assigned a visual theme such as cyclical movement, abstract pattern or light in motion, as well as a specific 'feel' that is determined by its musical content. (...) The music includes slow, subtle transformations, gentle textures, drones and a fairly static harmonic structure.
>
> (**Hugill2013a**)

The source text for the libretto is shown below courtesy of Lee Scott (**Scott2014**). 'Mood' keywords are shown in bold with lines of the libretto below.

Confusing
... my tuning fork. imagine the perplexity of a man outside time ...
... mandrills or clowns, spread their caudal fins out wide like acrobats ...
... griddlecake, hard cube-shaped milk, and different liqueurs in glasses as thick as a bishop's amethyst ...

Playful
... peacocks' tails, gave us a display of dancing on the glassy ...

Busy
... wasps and bumblebees and the vibration of a fly's wing ...

Driving
... bodies striking the hours of union and division of the black ...

Disjointed
... tangential point of the universe, distorting it according to the sphere's ...

Sadness
... others: may your dire sorrow flyaway ...
... no longer deep enough to satisfy our honour ...
... other side of the green sleep of hulls; ships passed away ...

Sweeping
... loved her like the infinite series of numbers ...
... the veritable portrait of three persons of god in three escutcheons ...

Fear
... it will set. fear creates silence nothing is terrifying ...
... forth revealing the distinction and evil engraved in the wood ...
... underground arose from ali baba screaming in the pitiless oil ...

Joy
... sibyls record the formula of happiness, which is double: be amorous ...
... the lord of the island gloried that his creation was good ...

Awe
... like earth; the enemy of fire and renascent from it ...
... awesome figure, warlike and sacerdotal, glared at the assembly ...
... is not an island but a man ...

Clocked
... quincuncial trees...

Tension
... the vigilant gaze of the spirit of the dead ...
... do not make as much noise as a single drum ...
... the oars made a clangourous sound as they scraped along the bow ...

Calm
... a strange upon a clam sea quilted with sand; faustroll ...
... each person present threw a pebble into the sea ...
... depth and with edges that tend to ebb and flow ...

Morphing
... in a striking metamorphosis the mourning color of the hangings turned ...

1.3 Dissemination & Impact

1.3.1 Publications

§   The research presented in this thesis was published in 3 main sources briefly described below.

Fania Raczinski and Dave Everitt : *Creative Zombie Apocalypse: A Critique of Computer Creativity Evaluation* (**Raczinski2016**). This conference paper critiqued issues in creative computing evaluation and by concatenating and enhancing existing models of creativity, proposed an initial outline of the interpretation and evaluation framework elaborated further in this thesis in chapter **??**. It was presented at the 2nd International Symposium for Creative Computing in Oxford in mid 2016. This paper did not mention pataphysics.

Fania Raczinski, Hongji Yang and Andrew Hugill : *Creative Search Using Pataphysics* (**Raczinski2013**). This conference paper described an earlier version of the `pata.physics.wtf` system (see chapter **??**), describing the 3 pataphysical algorithms and an overall outline of the motivation and implementation of this early prototype. The paper was presented in Sydney at the 9th ACM Conference on Creativity and Cognition in mid 2013.

Andrew Hugill, Hongji Yang, Fania Raczinski and James Sawle : *The pataphysics of creativity: developing a tool for creative search* (**Hugill2013d**). This article was published in the Digital Creativity journal in late 2013. It introduced the motivation for using pataphysics to support computer creativity and discussed early thoughts on a possible architecture and design of a pataphysical search system. This article was written before the development of the first prototype so only discussed theoretical work.

James Sawle, Fania Raczinski and Hongji Yang : *A Framework for Creativity in Search Results* (**Sawle2011**). This was an early conference paper presented (by James Sawle) at the 3rd International Conference on Creative Content Technologies in Rome in 2011. It introduced an early evaluation metric for creative search.

1.3.2 Talks & Exhibits

In addition to the conference talks, `pata.physics.wtf` and the related research was exhibited at various events or discussed in public seminars listed below.

June 2016

Exhibited `pata.physics.wtf` at the Institute of Creative Technologies (IOCT)

Creative Technologies postgraduate student showcase at the Innovation Centre of De Montfort University ([DMU](#)).

October 2015

Computer Arts Society ([CAS](#)) seminar on *Pata-computed Poetry* at the Phoenix ███ centre for independent film, art and digital culture in Leicester (**Clark2015**; **Clark2015a**).

November 2014

Exhibited `pata.physics.wtf` at the [IOCT](#) Leicester Media School ([LMS](#)) launch showcase at [DMU](#).

August 2014

Exhibited `pata.physics.wtf` at the [IOCT](#) PhD research showcase at the Phoenix Cube Gallery in Leicester (**Clark2014**).

February 2013

Contributed to a talk on *The Pataphysics of the Future* by Andrew Hugill, Hongji Yang and Fania Raczinski at the Transdisciplinary Common Room ([TDC](#)) at [DMU](#) (**Trans2013**).

1.3.3 Community Impact

`pata.physics.wtf` has received some nice feedback from the community.

In 2014 the site was featured on `patakosmos.com`, a *Pataphysical Terrestrial and Extraterrestrial Institutes Tourist Map* by Giovanni Ricciardi (**Ricciardi2014**). He called it an "exceptional tool, an online project that dismantles and continually redefines all meaning. La ′pataphysique est la fin des fins.". Image [1.3](#) shows a screenshot of the site from late 2014.

At the [LMS](#) launch in 2014 where `pata.physics.wtf` was showcased the [DMU](#) Twitter account sent a nice little review as shown below.

pataphysics Google twisted twin! Great IOCT project   Tweet by @dmuleicester

In 2016 `pata.physics.wtf` received a lovely piece of fan-mail by the Musée Patamécanique.

Dear Imaginary friend,

We love what you love and we think your work is lovely. Thank you for helping to bring the syzygy search engine to life.

Truly. Love, Your imaginary friends and fans here at Musée Patamécanique

(**Musee2016**)

[Go to TOC](#)

Figure 1.3 – Screenshot of `www.patakosmos.com` in 2014

INTERLUDE II

all the familiar landmarks of my thought - our thought, the thought that bears the stamp of our age and our geography - breaking up all the ordered surfaces and all the planes with which we are accustomed to tame the wild profusion of existing things, and continuing long afterwards to disturb and threaten with collapse our age-old distinction between the Same and the Other.

(Foucault 1966)—taking about Borges

Only those who attempt the absurd achieve the impossible.

(attributed to M.C. Escher)

A great truth is a truth whose opposite is also a great truth. Thomas Mann

(as cited in Wickson, Carew and Russell 2006)

Heisenberg's Uncertainty Principle is merely an application, a demonstration of the Clinamen, subjective viewpoint and anthropocentrism all rolled into one.

(Jarry 2006)

Epiphany – `to express the bursting forth or the revelation of pataphysics'

Dr Sandomir (Hugill 2012, p.174)

Machines take me by surprise with great frequency.

(Turing 2009, p.54)

The view that machines cannot give rise to surprises is due, I believe, to a fallacy to which philosophers and mathematicians are particularly subject. This is the assumption that as soon as a fact is presented to a mind all consequences of that fact spring into the mind simultaneously with it.

(Turing 2009, p.54)

17

Opposites are complementary.
It is the hallmark of any deep truth that its negation is also a deep truth.
Some subjects are so serious that one can only joke about them.   Niels Bohr

There is no pure science of creativity, because it is paradigmatically idiographic — it can only be understood against the backdrop of a particular history.

(Elton 1995)

Tools are not just tools. They are cognitive interfaces that presuppose forms of mental and physical discipline and organization. By scripting an action, they produce and transmit knowledge, and, in turn, model a world.   (Burdick et al. 2012, p.105)

Humanists have begun to use programming languages. But they have yet to create programming languages of their own: languages that can come to grips with, for example, such fundamental attributes of cultural communication and traditional objects of humanistic scrutiny as nuance, inflection, undertone, irony, and ambivalence.

(Burdick et al. 2012, p.103)

Part V

MΣTA-LΘGICALYSIS

from a few sea, gobble ebery bit ob de meat off a skull, feat here of the customary, he might do it by the mere smell of one of his drugs. D'un jet de science lectrique, 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 panting horse let go, there will be a scorching heat, the Oath of the Little men.

Part VI

HAPPILY EVER AFTER

Matter intense vibrates with fierce, the latter granting us his assistance in our journey in quest of his father Ulysses, but often, in our undertaking. It was later before I felt the force of its later that he had met him, if here I enter, the gas to be materials is a gas. Knew as much about the matter as I did — which Center, I found out these latter formed from was nothing, it was impossible to enter the cellar due to, in spite of ate and her hen, Ushering in a few moments, the prussic, the odor with way, closing in upon us.

INTERLUDE III

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. As he did once de vieilles a fanons, chuchote une collection de vieilles a fanons, chuchote une collection the position of the horns of bulls, And the sea coast of Tyre and Sidon, there the incarnate of a rose upon the Bush, and the last state of that man out of the list of Mankind, to move from my

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Go to TOC

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