

# Henri Poincaré

# Maths as an Exploration of the

# Human Unconscious

Creativity in Mathematics

(See: Science et Méthode Chapter 3 : L'invention mathématique)

# Pierre Reverdy's Definition of the Poetic Image

“The image is a pure creation of the mind. It cannot arise from a comparison but from **the coming together of two more or less distant realities**.

**The more distant and just the relationship of the two realities**, the stronger the image - the more ***emotional power*** and ***poetic reality*** it will have ... etc.”

Pierre Reverdy, Revue Nord-Sud, mars 1918.

As quoted by André Breton in the **First Surrealist Manifesto** - 1924.

# Poincaré's Definition of Mathematical Creation (1)

“ The mathematical facts worthy of being studied are those which, *by their analogy with other facts*, are capable of leading us to the knowledge of a mathematical law just as experimental facts lead us to the knowledge of a physical law.

They are those which reveal to us **unsuspected kinship between other facts**, long known, but wrongly believed to be **strangers to one another.** ”

## Poincaré's Definition of Mathematical Creation (2)

“ Among chosen combinations **the most fertile will often be those formed of elements drawn from domains which are far apart.**

Not that I mean as sufficing for invention the bringing together of objects as disparate as possible ; most combinations so formed would be entirely sterile.

But **certain among them, very rare, are the most fruitful of all.**”

# Temporary Conclusion...

Both definitions are not only similar, but almost identical.

The only difference is the intellectual domain to which they apply ...

**However...**

**Poincaré's definition was published in 1908**, more than 10 years before that of Reverdy (**1918**), which itself precedes the publication of the First Manifesto (**1924**) by 6 years.

As an indication, Sigmund Freud's first important work "Die Traumdeutung" was published in **1900**.

## Further : How Does The Unconscious Do It ?

“ To invent, have I said, is to choose ; but the word is perhaps not wholly exact. It makes one think of a purchaser before whom are displayed a large number of samples, and who examines them, one after the other, to make a choice. **Here the samples would be so numerous that a whole lifetime would not suffice to examine them.**

*This is not the actual state of things. **The sterile combinations do not even present themselves to the mind of the inventor.** Never in the field of his consciousness do combinations appear that are not really useful, except some that he rejects but which have to some extent the characteristics of useful combinations.”*

# Emotion as the source of unconscious selection...

“ What is the cause that, among the thousand products of our unconscious activity, some are called to pass the threshold, while others remain below ?

Is it a simple chance which confers this privilege ? Obviously not ; **among all the stimuli of our senses, for example, only the most intense fix our attention**, unless it has been drawn to them by other causes.

More generally the privileged unconscious phenomena, those susceptible of becoming conscious, are those which, directly or indirectly, affect most deeply **our emotional sensibility.**”

(See Damasio...)

# Maths, Emotions and Aesthetics...

“ It may be surprising to see emotional sensibility invoked à propos of mathematical demonstrations which, it would seem, can interest only the intellect.

This would be to forget the feeling of **mathematical beauty**, of the **harmony** of numbers and forms, of geometric **elegance**.

This is a true **aesthetic feeling** that all real mathematicians know, and it surely belongs to **emotional sensibility**. ”



# Back to Basics... Definitions of Surrealism

“ **Pure psychic automatism**, by which one proposes to express, either verbally, or in writing, or in any other way, **the real functioning of thought.**”

*Is the functioning of mathematical **thought** less real than poetical thought ?*

“ Dictation of thought, in **the absence of any control exercised by reason**, apart from any aesthetic or moral concern [...] ”

*A simple visual examination of Breton's poetry manuscripts shows that his poems are “**verified**” (like Poincaré's mathematical findings). They are usually **not pure automatic writing at all.***

# Conclusion : One Single Human Thought

Nothing restricts "the real functioning of thought" to the strict domain of literature, poetry and the arts and, on the contrary, the issue in question in the First Manifesto indeed **covers all human thought**.

What is called "rational thinking" is largely derived from the **division of labor** ... It is a mode of **breaking down** and **presenting** the **results** of thinking in a standard way... Which provides the basis for **verification mechanisms** (which can now be performed by a computer)

Yet, **if there is no human finding to prove, computer demonstrations are irrelevant**.

**Maths** are a creative activity relying on the unconscious, just like poetry (*and the rest*).

# Is the Unconscious more clever than the Conscious ?

“ **The subliminal self is in no way inferior to the conscious self**; it is not purely automatic; it is capable of discernment ; it has tact, delicacy ; it knows how to choose, to divine.

What do I say? It *knows better* how to divine than the conscious self, since it **succeeds where that has failed.**

In a word, **is not the subliminal self superior to the conscious self?** ”

# The Unconscious (unfortunately) does not Calculate

“ It never happens that the unconscious work gives us the ready-made result of a somewhat long calculation, where we only have to apply fixed rules. **We might think the wholly automatic subliminal self** as being particularly apt for this sort of work, which is in a way exclusively mechanical.

When thinking in the evening upon the factors of a multiplication, we might hope to find the product ready made by the unconscious upon our awakening, [...]. Nothing of the sort, as observation proves. All that one may hope from these fruits of unconscious work, **is a point of departure for such calculations.** ”

# Further reading..

**Another Exploration of the Unconscious - Une autre exploration de l'inconscient by Pierre Petiot** (includes remarks by A. Grothendieck)

<https://www.lulu.com/shop/pierre-petiot-and-zazie/another-exploration-of-the-unconscious-une-autre-exploration-de-l-inconscient/paperback/product-m9279n.html?page=1&pageSize=4>

## **Book**

<https://www.web-pourpre.fr/LaBelleInutile/Site/2-Surrealism/2-Orientations/UneAutreExplorationDeL'Inconscient/AutreModeExplorationInconscient-02.pdf>

## **Cover**

<https://www.web-pourpre.fr/LaBelleInutile/Site/2-Surrealism/2-Orientations/UneAutreExplorationDeL'Inconscient/Cover/Cover-1.pdf>

# Appendix :

Automatic Mathematics : Poincaré's Anecdote

# Automatic Mathematics (1)

“ It is time to penetrate deeper and *to see what goes on in the very soul of the mathematician.* For this, I believe, I can do best by recalling memories of my own. But I shall limit myself to telling how I wrote my first memoir on Fuchsian functions.

For fifteen days I strove to prove that there could not be any functions like those I have since called Fuchsian functions. I was then very ignorant; every day I seated myself at my work table, stayed an hour or two, tried a great number of combinations and reached no results.

One evening, contrary to my custom, I drank black coffee and could not sleep. **Ideas rose in crowds; I felt them collide until pairs interlocked, so to speak, making a stable combination.**

By the next morning I had established the existence of a class of Fuchsian functions, those which come from the hypergeometric series; *I had only to write out the results, which took but a few hours.*”

## Automatic Mathematics (2)

“ Then I wanted to represent these functions by the quotient of two series; this idea was perfectly conscious and deliberate, *the analogy with elliptic functions guided me*. I asked myself what properties these series must have if they existed, and I succeeded without difficulty in forming the series I have called theta-Fuchsian. Just at this time I left Caen, where I was then living, to go on a geologic excursion under the auspices of the *Ecole des Mines*. The changes of travel made me forget my mathematical work.

Having reached Coutances, we entered an omnibus to go some place or other. **At the moment when I put my foot on the step the idea came to me, without anything in my former thoughts seeming to have paved the way for it**, that the transformations I had used to define the Fuchsian functions were **identical (*analogy again*)** with those of non-Euclidean geometry.

**I did not verify the idea; I would not have had time**, as, upon taking my seat in the omnibus, I went on with a conversation already commenced **but I felt a perfect certainty**. *On my return to Caen*, for conscience' sake *I verified the result* at my leisure. ”



## Automatic Mathematics (3)

“ Then I turned my attention to the study of some arithmetical questions apparently without much success and **without a suspicion of any connection with my preceding researches**. Disgusted with my failure, I went to spend a few days at the sea-side, and thought of something else.

One morning, walking on the promontory, **the idea came to me, with just the same characteristics of brevity, suddenness and immediate certainty**, that the arithmetic transformations of indeterminate ternary quadratic forms were **identical** with those of non-Euclidean geometry **(Analogy strikes again)**. ”

## Automatic Mathematics (4)

“ Returned to Caen, I meditated on this result and deduced the consequences. The example of quadratic forms showed me that there were Fuchsian groups other than those **corresponding** to the hypergeometric series ; I saw that I could apply to them the theory of theta-Fuchsian series and that consequently there existed Fuchsian functions other than those from the hyper-geometric series, the ones I then knew. (Analogy as a guide for thinking further)

Naturally I set myself to form all these functions. I made a systematic attack upon them and carried all the outworks, one after another. *There was one however that still held out, whose fall would involve that of the whole place.* But all my efforts only served at first the better to show me the difficulty, which indeed was something. All this work was perfectly conscious. ”

## Automatic Mathematics (5)

“ Thereupon I left for Mont-Valerien, where I was to go through my military service; so I was very differently occupied.

**One day, going along the street, the solution of the difficulty which had suddenly stopped me, appeared to me.** I did not try to go deep into it immediately, and only after my service did I again take up the question.

I had all the elements and had only to arrange them and put them together. So I **wrote out my final memoir at a single stroke and without difficulty.** ”

## Automatic Mathematics (6)

“ I shall limit myself to this single example; it is useless to multiply them. In regard to my other researches I would have to say analogous things, and **the observations of other mathematicians given in *L'enseignement mathématique* would confirm them.**

Most striking at first is this appearance of **sudden illumination**, a manifest sign of long, unconscious prior work. **The role of this unconscious work in mathematical invention appears to me incontestable**, and traces of it would be found in other cases where it is less obvious. ”