# Occurrence of Expanding Multiverse

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**Abstract:** *The occurrence of the expanding multiverse has been discussed.*

**Keywords:** *occurrence of universe and multiverse*

## 1. INTRODUCTION

In the previous article [1] the occurrence of the expanding universe was related to the number of dimensions. The interest of this paper is to evaluate the occurrence of the expanding multiverse.

## 2. THE OCCURRENCE OF THE EXPANDING MULTIVERSE

The occurrence of the expanding universe $p_{universe}(n)$ depends on the number of dimensions $n$ as follows [1]:

$$p_{universe}(n) = \frac{6}{\pi^2}\frac{1}{n^2}. \tag{1}$$

Where the number of dimensions $n$ equals the ratio of speeds of the expanding one and $n$ dimensional universe:

$$n = \frac{v_{expanding}(1)}{v_{expanding}(n)}. \tag{2}$$

On the other hand, the occurrence of the expanding multiverse is manifested by the average occurrence of possible multidimensional universes:

$$p_{multiverse}(n) = \frac{\sum_{n=1}^{n\in\mathbb{N}} p_{universe}(n)}{n}. \tag{3}$$

Applying the relation $\sum_{n=1}^{n=\infty}\frac{1}{n^2} = \frac{\pi^2}{6}$ [1] the next occurrence of the expanding multiverse is estimated:

$$p_{multiverse}(n) \leq \frac{\sum_{n=1}^{n=\infty} p_{universe}(n)}{n} = \frac{\frac{6}{\pi^2}\sum_{n=1}^{n=\infty}\frac{1}{n^2}}{n} = \frac{1}{n}\frac{6}{\pi^2}\sum_{n=1}^{n=\infty}\frac{1}{n^2} = \frac{1}{n}\frac{6}{\pi^2}\frac{\pi^2}{6} = \frac{1}{n}. \tag{4}$$

Thus

$$p_{multiverse}(n) \approx \frac{1}{n}. \tag{5a}$$

For example

$$p_{multiverse}(n < \infty) < \frac{1}{n} > 0. \tag{5b}$$

And

$$p_{multiverse}(n = \infty) = \frac{1}{n} = 0. \tag{5c}$$

The above formulas (3, 4, 5) indicate that the occurrence of the expanding multiverse $p_{multiverse}(n)$ is inversely proportional to the number of universe dimensions $n$. Some values are collected in Table 1.

**Table1.** *Some values of occurrence of the expanding universe as well as multiverse*

| Number of dimensions ($n \in \mathbb{N}$) | Occurrence of universe | Occurrence of multiverse | Estimated occurrence of multiverse $\left(\frac{1}{n}\right)$ |
|---|---|---|---|
| 1 | 0,6079 | 0,6079 | 1,0000 |
| 2 | 0,1520 | 0,3800 | 0,5000 |
| 3 | 0,0675 | 0,2758 | 0,3333 |
| 4 | 0,0380 | 0,2164 | 0,2500 |
| 5 | 0,0243 | 0,1780 | 0,2000 |
| 6 | 0,0169 | 0,1511 | 0,1667 |
| 7 | 0,0124 | 0,1313 | 0,1429 |
| 8 | 0,0095 | 0,1161 | 0,1250 |
| 9 | 0,0075 | 0,1040 | 0,1111 |
| 10 | 0,0061 | 0,0942 | 0,1000 |
| 11 | 0,0050 | 0,0861 | 0,0909 |
| 12 | 0,0042 | 0,0793 | 0,0833 |
| 13 | 0,0036 | 0,0735 | 0,0769 |
| 14 | 0,0031 | 0,0684 | 0,0714 |
| 15 | 0,0027 | 0,0641 | 0,0667 |
| 16 | 0,0024 | 0,0602 | 0,0625 |
| 17 | 0,0021 | 0,0568 | 0,0588 |
| 18 | 0,0019 | 0,0537 | 0,0556 |
| 19 | 0,0017 | 0,0510 | 0,0526 |
| **20** | **0,0015** | **0,0485** | **0,0500** |
| 21 | 0,0014 | 0,0463 | 0,0476 |
| … | … | … | … |
| ∞ | 0 | 0 | 0 |

It is evident from Table1 that the occurrence of multiverse is more favourable than the occurrence of universe alone. For instance, the 5% occurrence of the ordinary matter with which we are familiar in the present universe [1] cannot be satisfied by the 0.0015 occurrence of 20-dimensional universe but it can be enabled by the 0.05 occurrence of the multiverse consisted of 20 expanding universes. Since:

$$p_{universe}(20) = 0,015 \neq p_{ordinary\ matter} = 5\%. \tag{6a}$$

But

$$p_{multiverse}(20) = 0,05 = p_{ordinary\ matter} = 5\%. \tag{6b}$$

## 3. CONCLUSION

The ordinary matter with which we are familiar in the present universe could be manifested with the help of average occurrence of about 20 expanding universes in the multiverse. The 4.6% occurrence of the 21-dimensional multiverse coincides even more closely with the occurrence of baryonic matter [2].

## DEDICATION
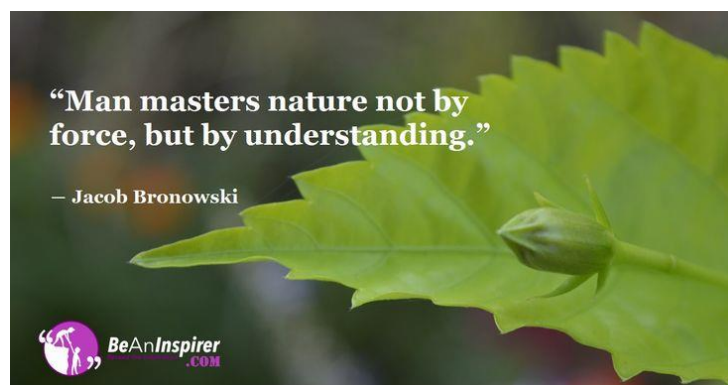
To the leaf of understanding



**Figure1.** *Leaf of understanding [3]*

## REFERENCES

[1] Janez Špringer (2023) "Ordinary Matter Manifesting in Average Three and Half Dimensional Space-Time" International Journal of Advanced Research in Physical Science (IJARPS) 10(3), pp.35-36, 2023.

[2] Physicists propose mechanism that explains the origins of both dark matter and 'normal' matter. Retrieved March 2023

[3] https://in.pinterest.com/pin/780459810400120650/. Retrieved March 2023

**Citation:** *Janez Špringer (2023) "Occurrence of Expanding Multiverse" International Journal of Advanced Research in Physical Science (IJARPS) 10(4), pp.1-3, 2023.*