A New Physics 4C Preon Model of Elementary Particles and Interactions

Józef Kajfosz

Institute of Nuclear Physics, Cracow, Poland

Institute of Nuclear Physics, Řež, Czech Republic

(Retired)

Abstract: A phenomenological model developed on the basis of the Lorentzian interpretation of the principle of relativity and of a strong interrelation between visible matter and the ether is presented, the process of its development is described, its properties, their consequences and some comments for its further development are given.

1. Introduction

First of all, I, the author, want to honestly inform and declare that I am neither a theoretical physicist nor an elementary particle expert. My professional work was experimental in nuclear spectroscopy. The composition of "elementary" particles was a hobby for me, a puzzle which intrigued me for decades. I am well aware that a professional reader can clearly see the limitation of my competence. I feel it painfully too while writing. But I beg the reader not to discard the whole content only because of that, without a thorough examination of the merits of it. I am fully convinced that what I present is correct and that the change I propose is vitally important for the future development of physics.

My efforts were of no avail until this lucky day when I tried to use preons in their present form. At this moment, everything started to be easier. From that day on I have felt to be led from surprise to surprise with a still growing conviction that what I touch is real.

2. Theoretical foundation of the model

For many decades physicists have been working hard to find a breakthrough in our understanding of the behavior of the visible matter. In an advanced Academia.edu search for "Preon + Model + Elementary particle", carried out on Dec.30.2020, 2,532 papers were found. But the success is still missing. We are convinced that this is due to a fatal mistake made in the first decade of the 20th century. A surprising but experimentally well-established fact, namely the impossibility to measure the "ether drift", called also "the principle of relativity" was then vividly debated. Two different interpretations of it were proposed: that of Albert Einstein, called STR, who stressed the equivalence of all frames of reference, and that of Hendrick A. Lorentz who maintained the classical concept of a privileged frame of reference and of absolute motion[1]. In Ref. [2] we analyzed this problem and found Lorentz's approach as absolutely preferable and free of any paradoxes. Then we tried to find out why in absolute motion the rods shrink, the clocks are slower, etc. This led us to the concept of an ether in the form of a "rain" of yet unknown kind of objects (the actons) moving in the privileged frame of reference in all directions with the speed of light c . In Ref. [3] we explain that the Lorentz's approach leads to an absolute necessity of a strong interrelation between the invisible ether and visible matter. In a frame moving with absolute velocity v this necessity can be seen clearly from the equation

$$\alpha_v = \frac{c}{\sqrt{(c+v)\cdot(c-v)}} = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} = \gamma_v \tag{1}$$

where α_v is the magnitude of the anisotropy of the velocity of ether components and γ_v is the magnitude of the effects like shortening the rods, slowing down of clocks, etc., and they are exactly equal. Obviously α_v is the cause and γ_v is the aftermath of it. On the contrary, Einstein's approach tends to suggest that the ether is redundant or even non-existent. Unfortunately, Einstein's approach became highly popular and dominated the mainstream physics completely while the Lorentz's approach was forgotten, ignored or even denied. Because of that the subject of the most important influence of the ether on visible matter has been taken out of the attention of scientists for some 115 years now.

How do we understand the term "new physics"? We completely and totally reject everything that has been built upon the prevailing meaning of Einstein's interpretation which we call "the no-ether world paradigm". Instead, we fully accept the Lorentz's interpretation and the strong interrelation between the visible matter and the ether which we call "the new paradigm of physics". Our Ref. [4] is a study of how to make a fundamental research in physics. Here especially important is the rule 3 in section 5 on page 5, as well as its more detailed explanation in subsection Re. 3 on page 6, as to how to propose new basic facts below the present limit of knowledge. We made use of it proposing the preons and we recommend it as a helpful tool in further development of this model.

[1] A detailed and richly documented historical account of those debates was published in Ref. [1], pp 72–87.

3. Basic assumptions of the model

1) There are four preons (fundamental components of particles): A^{++}, B^{+-}, C^{--}, D^{-+}, where the superscripts belong to the electric charge Q and the baryon number B. Their values are ±½ ε, where ε is the electric charge of the positron, and ±½ β, where β is the baryon number unit. Those preons are neither bosons nor fermions and are hence more fundamental constituents of matter which cannot exist as separate entities.

2) Each particle is composed of a certain number of the four fundamental components. In all decays and interactions the total number of components of each kind is strictly conserved.

The composition of a particle can be expressed as [*abcd*], where *a* is the number of components A^{++}, *b* the number of B^{+-}, etc. The charges Q and B of a particle are thus:

$$Q = \tfrac{1}{2}\,(a+b-c-d) \text{ and } B = \tfrac{1}{2}\,(a-b-c+d). \quad (2)$$

3) The total number of preons of each particle is always even. The sum $s = a+b+c+d$ can thus be 2, 4, 6, etc. Particles composed of 2, 6, 10, etc. preons are fermions while those composed of 4, 8, 12, etc. preons are bosons.

4) The conservation law can be expressed as:

$$\Sigma a_L = \Sigma a_R\, ,\ \Sigma b_L = \Sigma b_R\, ,\ \Sigma c_L = \Sigma c_R\, ,\ \Sigma d_L = \Sigma d_R\, , \quad (3)$$

where the sum is over all the particles entering (at the left side) and outgoing (at the right side) of the decay process.

5) The decays of particles are not spontaneous but are the results of a permanent strong interrelation between visible matter and the invisible ether. In particular, every decay is caused by a capture of or a collision with E, W, or $\tilde{W}$ which are ether constituents, neutral bosons with negligible masses and energies. E enters the "electromagnetic" and "strong" processes and W or $\tilde{W}$ enters the "weak" processes. Higher order (less probable) processes are those with the participation of EE, EEE, etc., or WE, $\tilde{W}E$, WEE, $\tilde{W}EE$, etc., respectively. The preon compositions of them are:

$$E \equiv [1111],\ \ W \equiv [2020], \text{ and } \tilde{W} \equiv [0202]. \quad (4)$$

The capture of E alone applies only to very fast transitions between states of the same composition. To trigger leptonic and more complex hadronic decays W or $\tilde{W}$ is necessary.

6) The proper inversion formula between the preon composition [*abcd*] of a particle and the preon composition of its antiparticle found after a long and tedious search is

$$[abcd] \leftrightarrow [\tfrac{1}{2}s-a, \tfrac{1}{2}s-b, \tfrac{1}{2}s-c, \tfrac{1}{2}s-d], \quad (5)$$

where $s = a + b + c + d$, i.e. the total number of components. Hence the sum of components of a particle and its anti-particle is always $[\tfrac{1}{2}s, \tfrac{1}{2}s, \tfrac{1}{2}s, \tfrac{1}{2}s]$.

4. Particle assignments

Found preon compositions of particles for the lowest s values (limited to charges 0, ±1) are presented in Table 1.

Table 1 Preon compositions [*abcd*] of particles and their assignments

	Q=+1	Q=0	Q=0	Q=–1		Q=+1	Q=0	Q=0	Q=–1
s=2, B=0 leptons	1100 e^+	1010 ν_μ	0101 $\tilde{\nu}_\mu$	0011 e^-	s=6, B=±1 baryons	4020 —	—	—	2040 —
s=4, B=0 mesons	1201 π^+	1111 π^0	1111 γ	1021 π^-		1311 $\tilde{\Sigma}^+$	1221 $\tilde{\Sigma}^0$	2112 Σ^0	2022 Σ^-
	2110 K^+	2020 K^0	0202 $\tilde{K}^0$	0112 K^-		2202 Σ^+	2112 Λ	1221 $\tilde{\Lambda}$	1131 $\tilde{\Sigma}^-$
s=6, B=0 leptons	1302 μ^+	1212 $\tilde{\nu}_e$	2121 ν_e	2031 μ^-		2220 $\tilde{\Xi}^+$	2130 $\tilde{\Xi}^0$	1203 Ξ^0	1113 Ξ^-
	2211 ?	2121 ?	1212 ?	1122 ?		3111 p	3021 N	0312 $\tilde{n}$	0222 $\tilde{p}$
	3120 τ^+	3030 $\tilde{\nu}_\tau$	0303 ν_τ	0213 τ^-		0402 —	—	—	0204 Ω^-

The shown assignments of individual compositions to known particles are the result of a considerable amount of investigation and computer experiments, for which the input data was a list of a number of prevailing decay modes of "ordinary" particles. All necessary particle data used in this investigation were taken from Ref. [5]. The assignments for τ^+, τ^-, ν_τ and $\tilde{\nu}_\tau$ were added later.

It was not too difficult to find particle assignments which would match all observed hadronic decay modes while for every particle assignment some of the leptonic decay modes remained unmatched. We found two different solutions of this problem. They will be discussed later.

5. The structure of particles

The application of the inversion found leads to important consequences. First of all, individual 4C preons do not have individual anti-preons. Moreover, not all combinations of preons have their anti-combinations. In order to fulfill the requirements of the rule 3 in Ref. [4] one has to express the composition of each particle as a set of the simplest (s = 2) fermions. There exist six such invertible fermions:

$$\boldsymbol{c} \equiv CD \equiv [0011] \equiv e^-$$

$$\tilde{\boldsymbol{c}} \equiv AB \equiv [1100] \equiv e^+$$

$$\boldsymbol{n} \equiv BD \equiv [0101] \equiv \tilde{\nu}_\mu \qquad (6)$$

$$\tilde{\boldsymbol{n}} \equiv AC \equiv [1010] \equiv \nu_\mu$$

$$\boldsymbol{b} \equiv AD \equiv [1001]$$

$$\tilde{\boldsymbol{b}} \equiv BC \equiv [0110] \ .$$

One can introduce their identification as $\boldsymbol{c}, \tilde{\boldsymbol{c}}$ (charged), $\boldsymbol{n}, \tilde{\boldsymbol{n}}$ (neutral), and $\boldsymbol{b}, \tilde{\boldsymbol{b}}$ (baryonic). It is good to remember, that four of them are simply the particles e^+, e^-, ν_μ and $\tilde{\nu_\mu}$.

There exist four other s = 2 fermions:

$$\begin{aligned} \boldsymbol{b}^+ &\equiv AA \equiv [2000] \\ \tilde{\boldsymbol{b}}^+ &\equiv BB \equiv [0200] \\ \tilde{\boldsymbol{b}}^- &\equiv CC \equiv [0020] \\ \boldsymbol{b}^- &\equiv DD \equiv [0002] \end{aligned} \tag{7}$$

but they are not invertible in the above-given sense.

The composition of each particle can indeed be expressed as a set of those fermions, hence the requirements of rule 3 are fulfilled and the preons proposed are legitimized. However, for some of the particles their set of fermionic components is not unique, i.e. their composition can be expressed in several different ways. For example the fermionic composition of the particles E, π^0 and γ can be expressed as $\boldsymbol{n}\tilde{\boldsymbol{n}}$, $\boldsymbol{c}\tilde{\boldsymbol{c}}$, or $\boldsymbol{b}\tilde{\boldsymbol{b}}$. In Table 2 we present for each particle a tentative set of its fermionic components.

Table 2 The tentative s = 2 fermion composition (ff) for particles and anti-part.

No.	particle	ff	anti-part.	ff		No.	particle	ff	anti-part.	ff
1	$\tilde{\nu_\mu}$	$\boldsymbol{n}$	ν_μ	$\tilde{\boldsymbol{n}}$		11	τ^-	$\boldsymbol{cnn}$	τ^+	$\tilde{\boldsymbol{c}}\tilde{\boldsymbol{n}}\tilde{\boldsymbol{n}}$
2	e^-	$\boldsymbol{c}$	e^+	$\tilde{\boldsymbol{c}}$		12	p	$\boldsymbol{b}\tilde{\boldsymbol{c}}\tilde{\boldsymbol{n}}$	$\tilde{p}$	$\tilde{\boldsymbol{B}}\boldsymbol{cn}$
3	π^0	$\boldsymbol{c}\tilde{\boldsymbol{c}}$	γ, E	$\tilde{\boldsymbol{c}}\boldsymbol{c}$		13	n	$\boldsymbol{b}\tilde{\boldsymbol{n}}\tilde{\boldsymbol{n}}$	$\tilde{n}$	$\tilde{\boldsymbol{B}}\boldsymbol{nn}$
4	π^-	$\boldsymbol{c}\tilde{\boldsymbol{n}}$	π^+	$\tilde{\boldsymbol{c}}\boldsymbol{n}$		14	Λ	$\boldsymbol{bn}\tilde{\boldsymbol{n}}$	$\tilde{\Lambda}$	$\tilde{\boldsymbol{b}}\tilde{\boldsymbol{n}}\boldsymbol{n}$
5	K^-	$\boldsymbol{cn}$	K^+	$\tilde{\boldsymbol{c}}\tilde{\boldsymbol{n}}$		15	Σ^+	$\boldsymbol{b}\tilde{\boldsymbol{c}}\boldsymbol{n}$	$\tilde{\Sigma}^-$	$\tilde{\boldsymbol{b}}\boldsymbol{c}\tilde{\boldsymbol{n}}$
6	$\tilde{K}^0, \tilde{W}$	$\boldsymbol{nn}$	K^0, W	$\tilde{\boldsymbol{n}}\tilde{\boldsymbol{n}}$		16	Σ^0	$\boldsymbol{bn}\tilde{\boldsymbol{n}}$	$\tilde{\Sigma}^0$	$\tilde{\boldsymbol{b}}\tilde{\boldsymbol{n}}\boldsymbol{n}$
7	$\tilde{\nu_e}$	$\boldsymbol{nn}\tilde{\boldsymbol{n}}$	ν_e	$\tilde{\boldsymbol{n}}\tilde{\boldsymbol{n}}\boldsymbol{n}$		17	Σ^-	$\boldsymbol{bc}\tilde{\boldsymbol{n}}$	$\tilde{\Sigma}^+$	$\tilde{\boldsymbol{b}}\tilde{\boldsymbol{c}}\boldsymbol{n}$
8	$\tilde{\nu_\tau}$	$\boldsymbol{nnn}$	ν_τ	$\tilde{\boldsymbol{n}}\tilde{\boldsymbol{n}}\tilde{\boldsymbol{n}}$		18	Ξ^0	$\boldsymbol{bnn}$	$\tilde{\Xi}^0$	$\tilde{\boldsymbol{b}}\tilde{\boldsymbol{n}}\tilde{\boldsymbol{n}}$
9	μ^-	$\boldsymbol{c}\tilde{\boldsymbol{n}}\tilde{\boldsymbol{n}}$	μ^+	$\tilde{\boldsymbol{c}}\boldsymbol{nn}$		19	Ξ^-	$\boldsymbol{bcn}$	$\tilde{\Xi}^+$	$\tilde{\boldsymbol{b}}\tilde{\boldsymbol{c}}\tilde{\boldsymbol{n}}$
10	?	$\boldsymbol{cn}\tilde{\boldsymbol{n}}$	?	$\tilde{\boldsymbol{c}}\tilde{\boldsymbol{n}}\boldsymbol{n}$		20	Ω^-	$\boldsymbol{b}^-\boldsymbol{nn}$	$\tilde{\Omega}^+$	–

6. Detailed results for the particles under study

In Table 3 we present data for a number of the prevailing decay modes of particles we studied. The first line of each decay mode contains the classical and the 4C schemes of it. The quantity ΔN is defined as $N_R - N_L$, where N_R is the number of particles at the right, and N_L at the left side of the scheme. The second line contains the tentative fermionic compositions of each particle, and the third line contains the preon compositions of them. For each decay mode the validity of the conservation laws of each of the four preons can be checked by summing their number at the left and at the right side of the scheme or simply summing the [*abcd*] compositions as four-digit numbers. The sums on both sides of the scheme are equal.

Let us now explain the two solutions of the problem of seemingly unmatched leptonic decay modes. One solution is to admit the existence of 4C decay schemes with a W or $\tilde{W}$ ether boson at the right side of the scheme. For example, the 4C scheme of the classical decay mode $\pi^+ \rightarrow \mu^+ \nu_\mu$ would be $\tilde{W}\, E\, \pi^+ \rightarrow \mu^+ \nu_\mu\ \tilde{W}$. This would mean that the captured ether boson disintegrates and passes its components to the leptons but from the remaining components of the decaying set of particles a similar ether boson is being formed and passed to the ether. The second solution is to admit that in these decays the identity of netrinos is different than assumed in the classical scheme, i.e. that the lepton number conservation law is violated. In Table 3 the seemingly unmatched decay modes are marked by an asterisk in the ΔN column and the 4C schemes shown are compatible with the second solution of the problem.

Table 3 Detailed data for all the particles studied
For explanation see text above.

No.	Classical scheme	ΔN	4C schemes
1	$\mu^- \rightarrow e^- \nu_\mu \tilde{\nu}_e$	1	$\tilde{W}\quad \mu^- \rightarrow e^- \quad \nu_\mu \quad \tilde{\nu}_e$
			nn cññ → c ñ nnñ
			[0202] [2031]=[0011] [1010] [1212]
2	$\mu^- \rightarrow e^- \nu_\mu \tilde{\nu}_e \gamma$	1	$\tilde{W}\quad E\quad \mu^- \rightarrow e^- \quad \nu_\mu \quad \tilde{\nu}_e \quad \gamma$
			nn cc̃ cññ → c ñ nnñ cc̃
			[0202] [1111] [2031]=[0011] [1010] [1212] [1111]
3	$\mu^- \rightarrow e^- \nu_\mu \tilde{\nu}_e e^+ e^-$	2	$\tilde{W}\quad E\quad \mu^- \rightarrow e^- \quad \nu_\mu \quad \tilde{\nu}_e \quad e^+ \quad e^-$
			nn cc̃ cññ → c ñ nnñ c̃ c
			[0202] [1111] [2031]=[0011] [1010] [1212] [1100] [0011]
4	$\pi^+ \rightarrow \mu^+ \nu_\mu$	*0	$\tilde{W}\quad \pi^+ \rightarrow \mu^+ \quad \tilde{\nu}_\mu$
			nn c̃n → c̃nn n
			[0202] [1201]=[1302] [0101]
5	$\pi^+ \rightarrow \mu^+ \nu_\mu \gamma$	*0	$\tilde{W}\quad E\quad \pi^+ \rightarrow \mu^+ \quad \tilde{\nu}_\mu \quad \gamma$
			nn cc̃ c̃n → c̃nn n cc̃
			[0202] [1111] [1201]=[1302] [0101] [1111]
6	$\pi^+ \rightarrow e^+ \nu_e$	0	$W\quad \pi^+ \rightarrow \quad e^+ \quad \nu_e$
			ññ c̃n → c̃ ññn
			[2020] [1201] = [1100] [2121]
7	$\pi^+ \rightarrow e^+ \nu_e \gamma$	0	$W\quad E\quad \pi^+ \rightarrow e^+ \quad \nu_e \quad \gamma$
			ññ cc̃ c̃n → c̃ ññn cc̃

			[2020] [1111] [1201]=[1100] [2121] [1111]
8	$\pi^+ \to e^+ \nu_e \pi^0$	0	$W \quad E \quad \pi^+ \to e^+ \quad \nu_e \quad \pi^0$
			$\tilde{n}\tilde{n} \quad c\tilde{c} \quad \tilde{c}n \to \tilde{c} \quad \tilde{n}\tilde{n}n \quad c\tilde{c}$
			[2020] [1111] [1201]=[1100] [2121] [1111]
9	$\pi^+ \to e^+ \nu_e e^+ e^-$	1	$W \quad E \quad \pi^+ \to e^+ \quad \nu_e \quad e^+ \quad e^-$
			$\tilde{n}\tilde{n} \quad c\tilde{c} \quad \tilde{c}n \to \tilde{c} \quad \tilde{n}\tilde{n}n \quad \tilde{c} \quad c$
			[2020] [1111] [1201]=[1100] [2121] [1100] [0011]
10	$\pi^0 \to \gamma\ \gamma$	0	$E \quad \pi^0 \to \gamma \quad \gamma$
			$c\tilde{c} \quad c\tilde{c} \to c\tilde{c} \quad c\tilde{c}$
			[1111] [1111]=[1111] [1111]
11	$\pi^0 \to e^+e^-\ \gamma$	1	$E \quad \pi^0 \to e^+ \quad e^- \quad \gamma$
			$c\tilde{c} \quad c\tilde{c} \to \tilde{c} \quad c \quad c\tilde{c}$
			[1111] [1111]=[1100] [0011] [1111]
12	$\pi^0 \to e^+e^-\ e^+e^-$	2	$E \quad \pi^0 \to e^+ \quad e^- \quad e^+ \quad e^-$
			$c\tilde{c} \quad c\tilde{c} \to \tilde{c} \quad c \quad \tilde{c} \quad c$
			[1111] [1111]=[1100] [0011] [1100] [0011]
13	$K^+ \to \mu^+ \nu_\mu$	0	$\tilde{W} \quad K^+ \to \mu^+ \quad \nu_\mu$
			$nn \quad \tilde{c}\tilde{n} \to \tilde{c}nn \quad \tilde{n}$
			[0202] [2110]=[1302] [2121]
14	$K^+ \to \pi^+ \pi^0$	0	$\tilde{W} \quad K^+ \to \pi^+ \quad \pi^0$
			$nn \quad \tilde{c}\tilde{n} \to \tilde{c}n \quad c\tilde{c}$
			[0202] [2110]=[1201] [1111]
15	$K^+ \to \pi^+ \pi^+ \pi^-$	0	$\tilde{W} \quad E \quad K^+ \to \pi^+ \quad \pi^+ \quad \pi^-$
			$nn \quad c\tilde{c} \quad \tilde{c}\tilde{n} \to \tilde{c}n \quad \tilde{c}n \quad c\tilde{n}$
			[0202] [1111] [2110]=[1201] [1201] [1021]
16	$K^+ \to \pi^0 e^+ \nu_e$	*0	$\tilde{W} \quad E \quad K^+ \to \pi^0 \quad e^+ \quad \tilde{\nu}_e$
			$nn \quad c\tilde{c} \quad \tilde{c}\tilde{n} \to c\tilde{c} \quad \tilde{c} \quad nn\tilde{n}$
			[0202] [1111] [2110]=[1111] [1100] [1212]
17	$K^+ \to \pi^+ \pi^0 \pi^0$	0	$\tilde{W} \quad E \quad K^+ \to \pi^+ \quad \pi^0 \quad \pi^0$
			$nn \quad c\tilde{c} \quad \tilde{c}\tilde{n} \to \tilde{c}n \quad c\tilde{c} \quad c\tilde{c}$
			[0202] [1111] [2110]=[1201] [1111] [1111]
18	$K^+ \to \mu^+ \nu_\mu \gamma$	0	$\tilde{W} \quad E \quad K^+ \to \mu^+ \quad \nu_\mu \quad \gamma$
			$nn \quad c\tilde{c} \quad \tilde{c}\tilde{n} \to \tilde{c}nn \quad \tilde{n} \quad c\tilde{c}$
			[0202] [1111] [2110]=[1302] [1010] [1111]
19	$K^+ \to e^+ \nu_e$	*0	$\tilde{W} \quad K^+ \to e^+ \quad \tilde{\nu}_e$
			$nn \quad \tilde{c}\tilde{n} \to \tilde{c} \quad nn\tilde{n}$
			[0202] [2110]=[1100] [1212]
20	$K^+ \to e^+ \nu_e \gamma$	*0	$\tilde{W} \quad E \quad K^+ \to e^+ \quad \tilde{\nu}_e \quad \gamma$
			$nn \quad c\tilde{c} \quad \tilde{c}\tilde{n} \to \tilde{c} \quad nn\tilde{n} \quad c\tilde{c}$
			[0202] [1111] [2110]=[1100] [1212] [1111]
21	$K_S^0 \to \pi^+ \pi^-$	0	$\tilde{W} \quad K_S^0 \to \pi^+ \quad \pi^-$
			$nn \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c\tilde{n}$
			[0202] [2020]=[1201] [1021]
22	$K_S^0 \to \pi^0 \pi^0$	0	$\tilde{W} \quad K_S^0 \to \pi^0 \quad \pi^0$
			$nn \quad \tilde{n}\tilde{n} \to c\tilde{c} \quad c\tilde{c}$
			[0202] [2020]=[1111] [1111]
23	$K_S^0 \to \pi^+ \pi^- \gamma$	0	$\tilde{W} \quad E \quad K_S^0 \to \pi^+ \quad \pi^- \quad \gamma$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c\tilde{n} \quad c\tilde{c}$
			[0202] [1111] [2020]=[1201] [1021] [1111]
24	$K_S^0 \to \pi^+ e^- \tilde{\nu}_e$	*0	$\tilde{W} \quad E \quad K_S^0 \to \pi^+ \quad e^- \quad \nu_e$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c \quad \tilde{n}\tilde{n}n$
			[0202] [1111] [2020]=[1201] [0011] [1212]
25	$K_S^0 \to \pi^- e^+ \nu_e$	*0	$\tilde{W} \quad E \quad K_S^0 \to \pi^- \quad e^+ \quad \tilde{\nu}_e$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{n} \quad \tilde{c} \quad nn\tilde{n}$
			[0202] [1111] [2020]=[1021] [1100] [1212]
26	$K_S^0 \to \pi^+ \mu^- \tilde{\nu}_\mu$	0	$\tilde{W} \quad E \quad K_S^0 \to \pi^+ \quad \mu^- \quad \tilde{\nu}_\mu$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c\tilde{n}\tilde{n} \quad n$
			[0202] [1111] [2020]=[1201] [2031] [0101]

27	$K_S^0 \to \pi^- \mu^+ \nu_\mu$	0	$\tilde{W} \quad E \quad K_S^0 \to \pi^- \quad \mu^+ \quad \nu_\mu$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{n} \quad \tilde{c}nn \quad \tilde{n}$
			[0202] [1111] [2020]=[1021] [1302] [1010]
28	$K_S^0 \to \pi^+ \pi^- e^+ e^-$	1	$\tilde{W} \quad E \quad K_S^0 \to \pi^+ \quad \pi^- \quad e^+ \quad e^-$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c\tilde{n} \quad \tilde{c} \quad c$
			[0202] [1111] [2020]=[1201] [1021] [1100] [0011]
29	$K_S^0 \to \gamma\, \gamma$	0	$\tilde{W} \quad K_S^0 \to \gamma \quad \gamma$
			$nn \quad \tilde{n}\tilde{n} \to c\tilde{c} \quad c\tilde{c}$
			[0202] [2020]=[1111] [1111]
30	$K_S^0 \to \pi^+ \pi^- \pi^0$	0	$\tilde{W} \quad E \quad K_S^0 \to \pi^+ \quad \pi^- \quad \pi^0$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c\tilde{n} \quad n\tilde{n}$
			[0202] [1111] [2020]=[1201] [1021] [1111]
31	$K_S^0 \to \pi^0 \gamma\ \gamma$	0	$\tilde{W} \quad E \quad K_S^0 \to ,\ \pi^0 \quad \gamma \quad \gamma$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{c} \quad c\tilde{c} \quad c\tilde{c}$
			[0202] [1111] [2020]=[1111] [1111] [1111]
32	$K_L^0 \to \pi^+ e^- \tilde{\nu_e}$	*0	$\tilde{W} \quad E \quad K_L^0 \to \pi^+ \quad e^- \quad \nu_e$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c \quad \tilde{n}\tilde{n}n$
			[0202] [1111] [2020]=[1201] [0011] [2121]
33	$K_L^0 \to \pi^- e^+ \nu_e$	*0	$\tilde{W} \quad E \quad K_L^0 \to \pi^- \quad e^+ \quad \tilde{\nu_e}$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{n} \quad \tilde{c} \quad nn\tilde{n}$
			[0202] [1111] [2020]=[1021] [1100] [1212]
34	$K_L^0 \to \pi^+ \mu^- \tilde{\nu_\mu}$	0	$\tilde{W} \quad E \quad K_L^0 \to \pi^+ \quad \mu^- \quad \tilde{\nu_\mu}$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c\tilde{n}\tilde{n} \quad n$
			[0202] [1111] [2020]=[1201] [2031] [0101]
35	$K_L^0 \to \pi^- \mu^+ \nu_\mu$	0	$\tilde{W} \quad E \quad K_L^0 \to \pi^- \quad \mu^+ \quad \nu_\mu$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{n} \quad \tilde{c}nn \quad \tilde{n}$
			[0202] [1111] [2020]=[1021] [1302] [1010]
36	$K_L^0 \to \pi^0 \pi^0 \pi^0$	0	$\tilde{W} \quad E \quad K_L^0 \to \pi^0 \quad \pi^0 \quad \pi^0$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{c} \quad n\tilde{n} \quad n\tilde{n}$
			[0202] [1111] [2020]=[1111] [1111] [1111]
37	$K_L^0 \to \pi^+ \pi^- \pi^0$	0	$\tilde{W} \quad E \quad K_L^0 \to \pi^+ \quad \pi^- \quad \pi^0$
			$nn \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c\tilde{n} \quad c\tilde{c}$
			[0202] [1111] [2020]=[1201] [1021] [1111]
38	$K_L^0 \to \pi^+ \pi^-$	0	$\tilde{W} \quad K_L^0 \to \pi^+ \quad \pi^-$
			$nn \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c\tilde{n}$
			[0202] [2020]=[1201] [1021]
39	$K_L^0 \to \pi^0 \pi^0$	0	$\tilde{W} \quad K_L^0 \to \pi^0 \quad \pi^0$
			$nn \quad \tilde{n}\tilde{n} \to c\tilde{c} \quad c\tilde{c}$
			[0202] [2020]=[1111] [1111]
40	$K_L^0 \to \pi^+ e^- \tilde{\nu_e}\, \gamma$	*0	$\tilde{W} \quad E \quad E \quad K_L^0 \to \pi^+ \quad e^- \quad \nu_e \quad \gamma$
			$nn \quad c\tilde{c} \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c \quad \tilde{n}\tilde{n}n \quad c\tilde{c}$
			[0202] [1111] [1111] [2020]=[1201] [0011] [2121] [1111]
41	$K_L^0 \to \pi^- e^+ \nu_e\, \gamma$	*0	$\tilde{W} \quad E \quad E \quad K_L^0 \to \pi^- \quad e^+ \quad \tilde{\nu_e} \quad \gamma$
			$nn \quad c\tilde{c} \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{n} \quad \tilde{c} \quad nn\tilde{n} \quad c\tilde{c}$
			[0202] [1111] [1111] [2020]=[1021] [1100] [1212] [1111]
42	$K_L^0 \to \pi^+ \mu^- \tilde{\nu_\mu}\, \gamma$	0	$\tilde{W} \quad E \quad E \quad K_L^0 \to \pi^+ \quad \mu^- \quad \tilde{\nu_\mu} \quad \gamma$
			$nn \quad c\tilde{c} \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to \tilde{c}n \quad c\tilde{n}\tilde{n} \quad n \quad c\tilde{c}$
			[0202] [1111] [1111] [2020]=[1201] [2031] [0101] [1111]
43	$K_L^0 \to \pi^- \mu^+ \nu_\mu\, \gamma$	0	$\tilde{W} \quad E \quad E \quad K_L^0 \to \pi^- \quad \mu^+ \quad \nu_\mu \quad \gamma$
			$nn \quad c\tilde{c} \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{n} \quad \tilde{c}nn \quad \tilde{n} \quad c\tilde{c}$
			[0202] [1111] [1111] [2020]=[1021] [1302] [1010] [1111]
44	$K_L^0 \to \pi^0 \pi^+ e^- \tilde{\nu_e}$	*0	$\tilde{W} \quad E \quad E \quad K_L^0 \to \pi^0 \quad \pi^+ \quad e^- \quad \nu_e$
			$nn \quad c\tilde{c} \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{c} \quad \tilde{c}n \quad c \quad \tilde{n}\tilde{n}n$
			[0202] [1111] [1111] [2020]=[1111] [1201] [0011] [2121]
45	$K_L^0 \to \pi^0 \pi^- e^+ \nu_e$	*0	$\tilde{W} \quad E \quad E \quad K_L^0 \to \pi^0 \quad \pi^- \quad e^+ \quad \tilde{\nu_e}$
			$nn \quad c\tilde{c} \quad c\tilde{c} \quad \tilde{n}\tilde{n} \to c\tilde{c} \quad c\tilde{n} \quad \tilde{c} \quad nn\tilde{n}$
			[0202] [1111] [1111] [2020]=[1111] [1021] [1100] [1212]
46	$\Omega^- \to \Lambda\, K^-$	0	$W \quad \Omega^- \to \Lambda \quad K^-$

		ññ b¯nn → bnñ cn
		[2020] [0204]=[2112] [0112]
47	$\Omega^- \to \Xi^0 \pi^-$	0	$W \quad \Omega^- \to \Xi^0 \quad \pi^-$
			ññ b¯nn → bnn cñ_
			[2020] [0204]=[1203] [1021]
48	$\Omega^- \to \Xi^- \pi^0$	0	$W \quad \Omega^- \to \Xi^- \quad \pi^0$
			ññ b¯nn → bcn cc̃
			[2020] [0204]=[1113] [1111]
49	$\Omega^- \to \Xi^0 e^- \tilde{\nu}_e$	*0	$W \quad E \quad \Omega^- \to \Xi^0 \quad e^- \quad \nu_e$
			ññ cc̃ b¯nn →bnn c ññn
			[2020] [1111] [0204]=[1203] [0011] [2121]
50	$\Omega^- \to \Xi^- \pi^+ \pi^-$	0	$W \quad E \quad \Omega^- \to \Xi^- \quad \pi^+ \quad \pi^-$
			ññ cc̃ b¯nn → bcn c̃n cñ
			[2020] [1111] [0204]=[1113] [1201] [1021]
51	$\Xi^- \to \Lambda \pi^-$	0	$W \quad \Xi^- \to \Lambda \quad \pi^-$
			ññ bcn → bnñ cñ
			[2020] [1113]=[2112] [1021]
52	$\Xi^- \to \Lambda e^- \tilde{\nu}_e$	*0	$W \quad E \quad \Xi^- \to \Lambda \quad e^- \quad \nu_e$
			ññ cc̃ bcn→ bnñ c ññn
			[2020] [1111] [1113]=[2112] [0011] [2121]
53	$\Xi^- \to \Lambda \mu^- \tilde{\nu}_\mu$	0	$W \quad E \quad \Xi^- \to \Lambda \quad \mu^- \quad \tilde{\nu}_\mu$
			ññ cc̃ bcn → bnñ cññ n
			[2020] [1111] [1113]=[2112] [2031] [0101]
54	$\Xi^- \to \Sigma^- \gamma$	0	$W \quad \Xi^- \to \Sigma^- \quad \gamma$
			ññ bcn→ bcñ ñn
			[2020] [1113]=[2022] [1111]
55	$\Xi^- \to \Sigma^0 e^- \tilde{\nu}_e$	*0	$W \quad E \quad \Xi^- \to \Sigma^0 \quad e^- \quad \nu_e$
			ññ cc̃ bcn→ bnñ c ññn
			[2020] [1111] [1113]=[2112] [0011] [2121]
56	$\Xi^0 \to \Lambda \pi^0$	0	$W \quad \Xi^0 \to \Lambda \quad \pi^0$
			ññ bnn → bnñ cc̃
			[2020] [1203]=[2112] [1111]
57	$\Xi^0 \to \Sigma^0 \gamma$	0	$W \quad \Xi^0 \to \Sigma^0 \quad \gamma$
			ññ bnn→ bnñ cc̃
			[2020] [1203]=[2112] [1111]
58	$\Xi^0 \to \Lambda \gamma$	0	$W \quad \Xi^0 \to \Lambda \quad \gamma$
			ññ bnn → bnñ cc̃
			[2020] [1203]=[2112] [1111]
59	$\Xi^0 \to \Sigma^+ e^- \tilde{\nu}_e$	*0	$W \quad E \quad \Xi^0 \to \Sigma^+ \quad e^- \quad \nu_e$
			ññ cc̃ bnn → bc̃n c ññn
			[2020] [1111] [1203]=[2202] [0011] [2121]
60	$\Xi^0 \to \Sigma^+ \mu^- \tilde{\nu}_\mu$	0	$W \quad E \quad \Xi^0 \to \Sigma^+ \quad \mu^- \quad \tilde{\nu}_\mu$
			ññ cc̃ bnn → bc̃n cññ n
			[2020] [1111] [1203]=[2202] [2031] [0101]
61	$\Sigma^+ \to p \pi^0$	0	$W \quad \Sigma^+ \to p \quad \pi^0$
			ññ bc̃n → bc̃ñ cc̃
			[2020] [2202]=[3111] [1111]
62	$\Sigma^+ \to n \pi^+$	0	$W \; \Sigma^+ \to n \; \pi^+$
			ññ bc̃n → bññ c̃n
			[2020] [2202]=[3021] [1201]
63	$\Sigma^+ \to p \gamma$	0	$W \quad \Sigma^+ \to p \quad \gamma$
			ññ bc̃n → bc̃ñ cc̃
			[2020] [2202]=[3111] [1111]
64	$\Sigma^+ \to n \pi^+ \gamma$	0	$W \quad E \quad \Sigma^+ \to n \quad \pi^+ \quad \gamma$
			ññ cc̃ bc̃n → bññ c̃n cc̃
			[2020] [1111] [2202]=[3021] [1201] [1111]
65	$\Sigma^+ \to \Lambda e^+ \nu_e$	0	$W \quad E \quad \Sigma^+ \to \Lambda \quad e^+ \quad \nu_e$
			ññ cc̃ bc̃n → bnñ c̃ ññn

			[2020] [1111] [2202]=[2112] [1100] [2121]
66	$\Sigma^0 \to \Lambda\ \gamma$	0	$E\quad \Sigma^0 \to \Lambda\quad \gamma$
			cc̃ bnñ → bnñ cc̃
			[1111] [2112]=[2112] [1111]
67	$\Sigma^0 \to \Lambda\ e^+ e^-$	1	$E\quad \Sigma^0 \to \Lambda\quad e^+\quad e^-$
			cc̃ bnñ → bnñ c̃ c
			[1111] [1221]=[2112] [1100] [0011]
68	$\Sigma^- \to n\ \pi^-$	0	$W\quad \Sigma^- \to n\quad \pi^-$
			ññ bcñ → bññ cñ
			[2020] [2022]=[3021] [1021]
69	$\Sigma^- \to n\ e^-\ \tilde{\nu}_e$	*0	$W\quad E\quad \Sigma^- \to n\quad e^-\quad \nu_e$
			ññ cc̃ bcñ → bññ c ññn
			[2020] [1111] [2022]=[3021] [0011] [2121]
70	$\Sigma^- \to n\ \pi^-\ \gamma$	0	$W\quad E\quad \Sigma^- \to n\quad \pi^-\quad \gamma$
			ññ cc̃ bcñ → bññ cñ cc̃
			[2020] [1111] [2022]=[3021] [1021] [1111]
71	$\Sigma^- \to n\ \mu^-\ \tilde{\nu}_\mu$	0	$W\quad E\quad \Sigma^- \to n\quad \mu^-\quad \tilde{\nu}_\mu$
			ññ cc̃ bcñ → bññ cññ n
			[2020] [1111] [2022]=[3021] [2031] [0101]
72	$\Sigma^- \to \Lambda\ e^-\ \tilde{\nu}_e$	0	$\tilde{W}\quad E\quad \Sigma^- \to \Lambda\quad e^-\quad \tilde{\nu}_e$
			nn cc̃ bcñ → bnñ c nnñ
			[0202] [1111] [2022]=[2112] [0011] [1212]
73	$\Lambda \to p\ \pi^-$	0	$W\quad \Lambda \to p\quad \pi^-$
			ññ bnñ → bc̃ñ cñ
			[2020] [2112]=[3111] [1021]
74	$\Lambda \to n\ \pi^0$	0	$W\quad \Lambda \to n\quad \pi^0$
			ññ bnñ → bññ cc̃
			[2020] [2112]=[3021] [1111]
75	$\Lambda \to n\ \gamma$	0	$W\quad \Lambda \to n\quad \gamma$
			ññ bnñ → bññ cc̃
			[2020] [2112]=[3021] [1111]
76	$\Lambda \to p\ \pi^-\ \gamma$	0	$W\quad E\quad \Lambda \to p\quad \pi^-\quad \gamma$
			ññ cc̃ bnñ → bc̃ñ cñ cc̃
			[2020] [1111] [2112]=[3111] [1021] [1111]
77	$\Lambda \to p\ e^-\ \tilde{\nu}_e$	*0	$W\quad E\quad \Lambda \to p\quad e^-\quad \nu_e$
			ññ cc̃ bnñ → bc̃ñ c ññn
			[2020] [1111] [2112]=[3111] [0011] [2121]
78	$\Lambda \to p\ \mu^-\ \tilde{\nu}_\mu$	0	$W\quad E\quad \Lambda \to p\quad \mu^-\quad \tilde{\nu}_\mu$
			ññ cc̃ bnñ → bc̃ñ cññ n
			[2020] [1111] [2112]=[3111] [2031] [0101]
79	$n \to p\ e^-\ \tilde{\nu}_e$	0	$\tilde{W}\quad E\quad n \to p\quad e^-\quad \tilde{\nu}_e$
			nn cc̃ bññ → bc̃ñ c nnñ
			[0202] [1111] [3021]=[3111] [0011] [1212]
80	$n \to p\ e^-\ \tilde{\nu}_e\ \gamma$	0	$\tilde{W}\quad E\quad E\quad n \to p\quad e^-\quad \tilde{\nu}_e\quad \gamma$
			nn cc̃ cc̃ bññ → bc̃ñ c nnñ cc̃
			[0202] [1111] [1111] [3021]=[3111] [0011] [1212] [1111]

7. Some facts as explained by the 4C preon model

1) The different behavior of matter in the micro-world. In the 4C preon model all the observed quantum mechanical effects can be easily understood as a result of frequent collisions of small objects with the fast moving ether components. The stochastic character of changes, the changing of physical quantities by portions, the uncertainty of them, etc. are obvious consequences of the presence of ether.

2) The so called wave-particle dualism. The new paradigm of physics, i.e. the fact of a strong interrelation between visible matter and the ether has a simple explanation of this mystery. The waves are formed by the multitude of ether components while the particles of visible matter swim in them like a ship in the sea.

3) The assumed sending of information about the absorbed particle with infinite velocity to the other particle. The 4C preon model renders for this difficult problem at least one additional source of information, the ether. It shall ”know” all details about mutual configuration of the two particles at the moment of their departure and carry this information with the particles to the place of their absorption.

4) The phenomenon of $K_S{}^0$ ***and*** $K_L{}^0$. It does not seem necessary to assume that they are two different particles. They are the same K^0 [2020] particles. The reason that some of them decay faster and some slower is the chirality of some of the set of decaying particles. Those which approach one another in a favorable configuration, decay faster, while the remaining ones decay slower.

5) The neutrino mixing. Because of small masses of the neutrinos such processes like $\tilde{W}$ [0202] ν_μ [1010] $\rightarrow \tilde{\nu_e}$ [1212] or $\tilde{W}$ [0202] ν_e [2121] $\rightarrow \tilde{\nu_e}$ [1212] γ [1111] or W [2020] E [1111] ν_τ [0303] $\rightarrow \tilde{\nu_\tau}$ [3030] $\tilde{W}$ [0202] $\tilde{W}$ [0202] and similar ones can explain the mixing. In a similar way, the mixing of K^0 [2020] and $\tilde{K}^0$ [0202] can take place: $\tilde{W}$ [0202] K^0 [2020] $\rightarrow W$ [2020] $\tilde{K}^0$ [0202] or W [2020] $\tilde{K}^0$ [0202] $\rightarrow K^0$ [2020] $\tilde{W}$ [0202].

6) The question of matter and antimatter. Since in the 4C preon model all particles as well as their antiparticles are composed of the four preons, the hypothetical Dirac’s sea can simply be forgotten.

7) The non-conservation of some physical quantities in „weak” decays. In the 4C preon model all quantities are always conserved. By the way, strangeness of each particle is

$$\boldsymbol{S} = \tfrac{1}{2}\, b + \tfrac{1}{2}\, c - d. \tag{8}$$

8) The properties of quarks. As known, quarks can explain only the composition of hadrons and for baryons only some of their combinations are useful. The 4C preon model is superior because it is more general and all combinations of pairs of the four preons form legitimate particles.

9) The doubtful existence of the $\boldsymbol{\Delta^-}$***(1232) particle.*** In the 4C preon model this particle cannot exist because its composition would be [3–131] but in the quark model it is a legitimate particle with its quark composition *ddd* . Remarkably, the particle data in Ref. [5]

do not contain even one single data or observation of it, although three other charge states of this multiplet are abundantly documented.

10) The stability of the proton. In the 4C preon model the baryon number is strictly conserved and therefore the proton cannot decay in any way since it is obviously the lightest baryon. Hence, measurements trying to lift its lifetime as high as possible are pointless.

8. Some explanatory comments about the model and its further development

1) In order to develop this model to a sound theory a huge amount of work has to be done. The main components of the ether (the actons) which in the piviledged state of inertial motion move isotropically with the speed of light, have to be modelled as a new kind of objects with properties suitable to ensure a) the stability of the ether itself, b) the validity of the law of inertia of ordinary matter even in states with large anisotropy of the speed of the main components of the ether, and c) the ability to resemble the electromagnetic and gravitational phneomena. In this task the application of the rules from Ref. [4] will be both necessary and helpful. The bosons W, $\tilde{W}$ and E are a part of the ether which move in space with a certain density, not necessarily with the speed of light, but they cannot be its main components.

2) As to the preon composition of particles presented in Table 1, the composition of all hadrons is definite and unique. This could be confirmed later after finding a surprising relation between the preons and the three lightest quarks and antiquarks:

$$\begin{aligned} d &= A - \tfrac{1}{3} B + C + \tfrac{1}{3} D \\ u &= A + \tfrac{2}{3} B + \tfrac{1}{3} D \\ s &= \tfrac{2}{3} B + 4/3\, D \\ \tilde{d} &= 4/3\, B + \tfrac{2}{3} D \\ \tilde{u} &= \tfrac{1}{3} B + C + \tfrac{2}{3} D \\ \tilde{s} &= A + \tfrac{1}{3} B + C - \tfrac{1}{3} D. \end{aligned} \tag{9}$$

Using these equations, the preon composition of all hadrons can be calculated from their quark composition. For example, for the proton one gets

$$p \equiv u+u+d = 2(A+\tfrac{2}{3} B+\tfrac{1}{3} D) + A-\tfrac{1}{3} B+C+\tfrac{1}{3} D = 3A+B+C+D \equiv [3111]. \tag{10}$$

Not even one composition had to be changed. But the preon compositions of leptons, and especially those of neutrinos and antineutrinos, are not unique and less certain. It would be desirable to make a thorough study based on experimental data in order to find the optimal preon compositions for them.

3) In Table 3 we do not list any decay modes for τ^- because of their multitude and difficulties with determining the most important of them. This is also a task yet to be done.

4) The development of the 4C preon model has just only begun. It has to be continued by including the massive excited states of mesons and baryons as well as the charmed, bottomed etc. particles. A preliminary study gives optimistic results. One can make use of the excited states of “ordinary” particles, of the alternative compositions of the $s = 2$ fermions, (for example to choose $\boldsymbol{b^{+}b\tilde{b}}$ instead of $\boldsymbol{b\tilde{c}\tilde{n}}$), and finally to use particles with $s > 6$.

5) An urgent task is to find the formula for calculation of the masses of particles. This means according to Ref. [4] to propose new facts below the present limit of knowledge. Therefore the rule 3 has to be applied in order to avoid unnecessary restrictions.

6) There are some differences between the quark and preon models which can be used for a definitive experimental refutation of one of them and confirmation of the other one. They are: the non-existence of $\tilde{\Omega}$ and $\Delta^{-}(1232)$, and the existence of $\Xi^{--}(1530)$, $\tilde{\Xi}^{++}(1530)$, $\tilde{\Xi}^{+++}(1530)$, [4020], [4110], [4200], [2140], [2040], [0402] (according to the preon model).

9. Conclusion

If this model is confirmed experimentally, its fate will depend on whether there are at least some theoretical physicists, high energy experts, willing to develop it gradually into a sound generally accepted scientific theory. Unfortunately, in the case of the two previous descriptions of this model during the last 12 years no such person has been found. This example demonstrates how difficult it is to change someone’s paradigm which governs his or her way of thinking over a lifetime. But it is impossible to ignore the experimental proofs. Therefore, now even the mainstream physicists speak about „new physics” because the experiments disprove the Standard Model more and more. But they still try just to repair it instead of rejecting it. Hence, only experimental results can lead to a change. So, our final challenge for you is to disprove the 4C preon model! Prove that it contradicts valid experimental results, using some of the differences in predictions of the preon and quark models, listed in **8.** ***7)*** above.

Acknowledgments

I highly appreciate the attentive support, fruitful suggestions and a constant encouragement of some of my colleagues from the two institutes of my previous work as well as from a number of other persons. I would also like to express my gratitude to my wife Emilia and my daughter Bogusława for their patience and support during my work at home, to my daughter and son-in-law Irena and Maciej Wilkosz for their improvement of my English and for their kind encouragement, and to my grandsons Natan and Bartek Wilkosz for their help with the tables.

References

[1] Jimena Canales, *Modern Physics: From Crisis to Crisis,* in: The Cambridge History of Modern European Thought, volume 2, The Twentieth Century, Edited by Peter F Gordon and Warren Breckman, pp. 72–101.
https://www.academia.edu/40483152/Modern_Physics_from_Crisis_to_Crisis

[2] J. Kajfosz, *On the alternative interpretation of special relativity*, Academia.edu
https://www.academia.edu/36608282/On_the_alternative_interpretation_of_special_relativity

[3] J. Kajfosz, *The principle of relativity and the ether*, Academia.edu
https://www.academia.edu/36608322/The_principle_of_relativity_and_the_ether

[4] J. Kajfosz, *Remarks on foundations of physics,* Academia.edu
https://www.academia.edu/36608253/Remarks_on_foundations_of_physics

[5] P.A. Zyla et al. (Particle Data Group), Prog. Theor. Exp. Phys. 2020, 083C01 (2020)
https://pdg.lbl.gov

The first version of this paper was written and published in 2008.
The second version was published in 2013.
The present third version was published in January 2021.