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RESEARCH ARTICLE

The Colored Plum Pancake Model:The Composite Proton and Neutron Molecules

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Abstract

We present a new model in which protons and neutrons are treated as composite "molecules" of sub-constituents, combining geometrical insights from J.J. Thomson´s early corpuscular atom with modern framework of quantum chromodynamics (QCD). Inspired on one side by Thomson´s extended distributions of charge and his mechanically stable electron configurations, and on the other by quark-gluon description of hadrons in QCD, we construct a hybrid picture where nucleons are structured objects built from clustered, interacting color charges. This "composite nucleon molecule" model aims to provide an intuitively accessible, quasi-classical representation of the internal proton and neutron structures that remain compatible with key constraints on form factors, plum distributions, and spin observables. We outline the basic architecture of the model and highlight several novel qualitative properties and testable consequences for low-energy nucleon observables. E.g., the neutron decay and the deuteron-triton fusion are described using this colored plum pancake model.

Keywords: Colored Plum Pancake, Composite Proton and Neutron, D+T Fusion, Neutron Decay, Quantum Chromodynamics.

1. Introduction

Since the beginning of the 20th century, our understanding of the internal structure of matter has undergone several profound revolutions. Lenard in 1903 [1] realized the first scattering experiments and concluded that the effective center of atom is concentrated in a tiny fraction of the atomic volume. Lenard´s „dynamide" model was an important predecessor of the atomic model of Rutherford from 1911 [2]. J.J. Thomson´s "plum pudding" model [3] was the first systematic attempt to describe atoms as extended dynamical systems of interacting charged constituents rather than indivisible points. In 1910, Haas [4] was the first who attempted to relate the Planck´s constant to the atomic construction based on the J.J. Thomson´s plum pudding model. Schidlof [5] modified the Haas´ model by assuming that a part of electricity was located at the center of the positive sphere in 1911.

In 1911, Nicholson [6] concluded that the Planck constant had an atomic significance and indicated that angular momentum could only change in discrete amounts. In 1912, Bjerrum [7] published the first quantum theory of molecules and treated vibrational and rotational energies of diatomic molecules. He described the rotational energy of a molecular dipole with the moment of inertia I. In 1913, Bohr presented his famous atomic model where he used some of the above cited models [8]. Many valuable reviews on the history of atomic models and their authors were published, e.g. [9]-[20]. These first quantum models inspired Niels Bohr for his famous model of hydrogen that was later overcome by quantum mechanics in 1925.

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Half a century later, the focus shifted to hadrons. In 1964, Gell-Mann [21] and Zweig [22] proposed that baryons and mesons are composed of more elementary constituents – quarks – arranged in simple flavor multiplets. The subsequent development of QCD introduced the color charges by Greenberg [23] in order to solve the Pauli exclusion principle for fermions.Despite this impressive progress, there remains a conceptual gap between the highly abstract, field-theoretic description of nucleons in QCD and the intuitive, quasi geometrical pictures that played such an important role in earlier stages of physics.

In this work we explore a hybrid "neo-Thomson-QCD" perspective on the proton, neutron, electron, and positron. Motivated by Thomson´s corpuscular configurations, we regard nucleons not as minimal three-quark system but as composite "molecules" of clustered color charges. In this sense, we seek to unify the intuitive structural richness of early corpuscular models with the quantitative discipline of QCD-based descriptions. In doing so, we hope to open a path toward a more geometrically transparent understanding of nucleon structure that remain firmly grounded in the empirical successes of QCD.

2. The Rutherford-Harkins-Landau-Chadwick Key

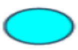
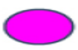
The Rutherford-Harkins-Landau-Chadwick (RHLCh) key is a novel theoretical framework for nuclear structure and reactions, proposed in a series of recent scientific papers, e.g. [24]-[26]. This model is a reinterpretation of early 20th-century nuclear physics models that predate the modern standard model of nucleus. The key refers to a set of principles derived from the pre-1934 work of pioneering physicists Ernest Rutherford [27], William Harkins [28]-[30], Lev Landau [31]-[33], and James Chadwick [34]. This approach revisits the idea of a compound neutron - a composition of a proton and an electron as a fundamental building block of the nucleus, a concept that was largely abandoned after the introduction of the neutron and neutrino theories by Pauli and Fermi in 1934 [35]. The missing energy of the beta decay in this new model is hidden in the rotating mother nucleus. This new model can offer a deeper understanding of nuclear events at the femtometer scale and guide the design of novel nuclear reactors, particularly in the field of low-energy nuclear reactions (LENR).

Based on the RHLCh key, several rules for describing the structure and reactions of nuclei are proposed: nuclei are formed as a ring of alpha particles with attached subunits, electrons within stable nuclei form specific bonds with protons, nuclear reactions like alpha decay, beta decay, and electron capture are reinterpreted based on this compound neutron model. In essence, the "Rutherford-Harkins-Landau-Chadwick key" is a contemporary attempt to use a pre-1934 theoretical foundation to explore alternative interpretations of nuclear physics phenomena.

3. The List of Colored Plums and their Basic Properties

We have combined the knowledge of the J.J. Thomson´s school and the knowledge of the QCD

Table 1. *The Properties of Colored Plums and Rotating Pancakes*

Plums	Color	Charge	Mass	Moment of inertia	Planck constant
	Red (R)	+2/3 e	$m_p/2$		
	Green (G)	+2/3 e	$m_p/2$		
	Blue (B)	-1/3 e	m_e		
	Cyan (G+B)	-2/3 e	m_e		
	Magenta (R+B)	-2/3 e	m_e		
	Yellow (R+G)	+1/3 e	m_e		
	White	+1 e	m_p proton	$I = 2\frac{m_p}{2}\lambda_p^2$	$h = I\omega = m_p\lambda_p c$
	Black	-1 e	m_e electron	$I = m_e\lambda_e^2$	$h = I\omega = m_e\lambda_e c$
	White	+1 e	m_e positron	$I = m_e\lambda_e^2$	$h = I\omega = m_e\lambda_e c$
	White	0 e	m_n neutron	$I = \left(2\frac{m_p}{2} + 2m_e\right)\lambda_n^2$	$h = I\omega = \left(2\frac{m_p}{2} + 2m_e\right)\lambda_n c$

school to newly describe nuclei as the composite "molecules" (proton, neutron, electron, positron) based on the color charges introduced in QCD. There is one new important property of these rotating pancakes with colored plums – inspired by Bjerrum [7] – the Planck constant h can be expressed.

$$h = I\omega = I\frac{c}{\lambda_x} \qquad (1)$$

where the symbol I represents the moment of inertia, ω is the angular velocity, c is the light speed, and λ_x is the radius of that rotating pancake – this value is identical with the Compton wavelength of that particle. Table I summarizes the basic properties of colored plums.

4. Rotating Pancakes with Colored Plums

Figures 1- 3 show the rotating pancakes with colored plums: proton, neutron, electron, and positron. The rotating color charges in two perpendicular directions need two turns to return back to the starting position – this behavior is described by the particle spin.

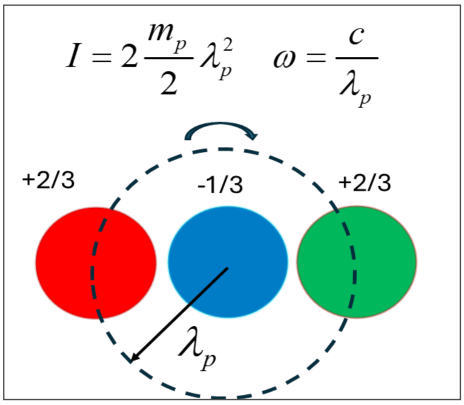


Figure 1. *The rotating proton with the radius λp ≈ 1.32 fm, the proton charge radius of the red and green plums is about r = 0.84 fm (proton radius puzzle).*

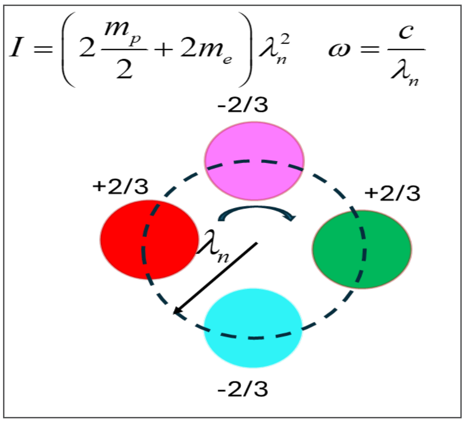


Figure 2. *The rotating neutron with the radius λn ≈ 1.32 fm, the proton charge radius of the red and green plums is about r = 0.84 fm (proton radius puzzle). The magenta and cyan color charges balance the color charges of the red and green plums.*

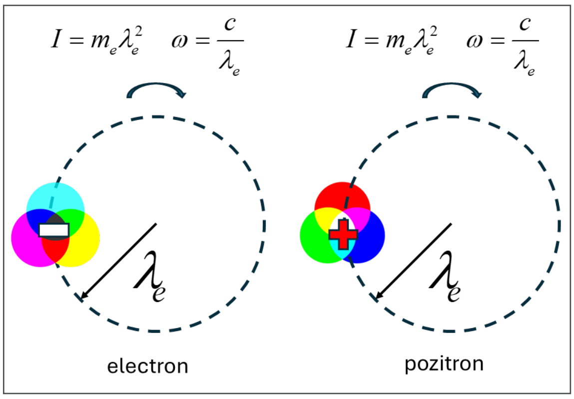


Figure 3. *The rotating electron and positron with the radius λe ≈ 2.42 pm, the combination of three different color charges leads to the total plus and minus charge of those two particles.*

Figure 4 depicts two turns of the composite proton in order to achieve the starting position and describes the spin of this rotating pancake with colored plums. This pancake rotates in two perpendicular directions with angular velocities $\omega_1 = c/\lambda_p$ and $\omega_2 = \omega_1/2$.

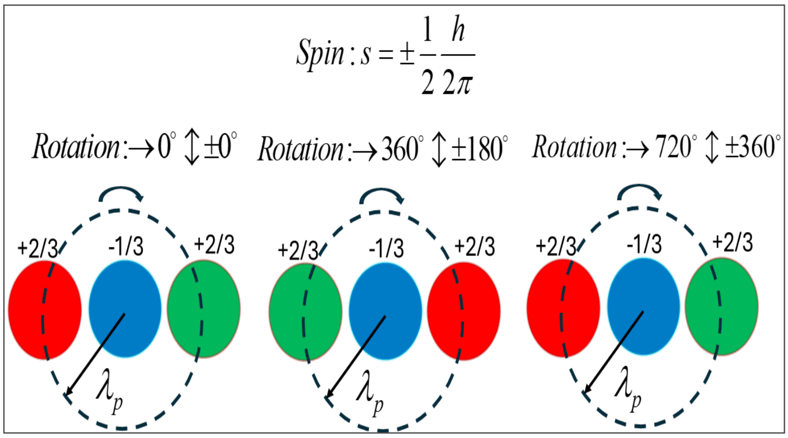


Figure 4. *The rotating proton in two perpendicular directions leads to the two turns of these pancakes in order to achieve the starting position – this quantitative value is known as the particle spin.*

5. Free Neutron Decay

Neutron in the composite nuclei is stabilized via electron bounds. Free neutron can decrease its binding energy via combination of two cyan and magenta plums shown in Figure 5. The magenta plum will get one green color charge from the cyan plum. The newly formed blue plum will be a part of the formed proton and the newly formed black plum is the free beta electron escaping into the surrounding. The decay energy is shared between the rotating proton and the rotating beta electron. In this model there is no need for the postulated neutrino [35].

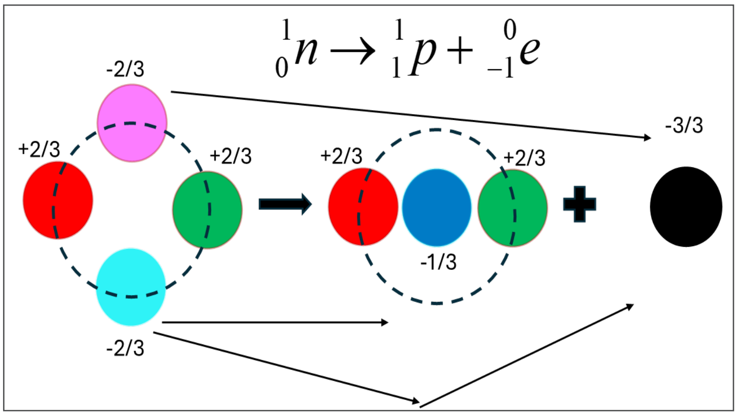


Figure 5. *Free neutron decay via exchange of color charges between the magenta and cyan plums. The decay energy is shared between the rotating proton and the rotating beta electron.*

6. Fusion of D + T Described by the Model of Colored Plums

The very important fusion reaction between deuteron and triton can be expressed using these colored plums organized in the rotating pancakes. This description is based on the knowledge of QCD and the J.J. Thomson´s school. We can get more details about the activities of individual particles. Figure 6 shows that the rotational energy of the formed neutron is very high in compare with the slowly rotating helium-4.

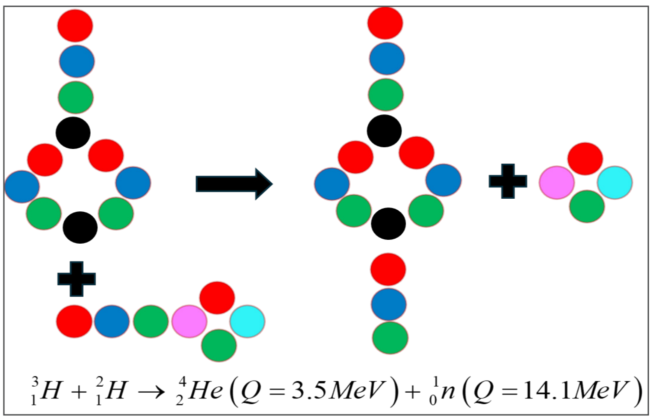


Figure 6. *Fusion of deuteron and triton expressed by the model of colored plums. The rotational energy of rotating pancakes differs.*

7. Conclusions: Towards a Shared Scientific Horizon

The integration of experimental findings from the J.J. Thomson´s school and the QCD school offers an intuitive and testable picture of nucleus.

1. This model was built on the J.J. Thomson´s school and the QCD school.
2. The properties of color plums were defined.
3. The rotating pancakes with colored plums lead to the expression of the Planck constant and the spin of nucleons.
4. This model should be further refined based on experimental data.

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Conflict of Interest

The author declares that there is no conflict of interest.

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