Einstein'ın Bilimsel Yöntem açısından "Günahı"

•"I have not succeeded formulating boundary conditions for spatial infinity"

•"The curvature of space is variable in time and place, according to the distribution of matter, but we may roughly approximate to it by means of a spherical space. At any rate, this view is logically consistent, and from the standpoint of the general theory of relativity lies nearest at hand; **whether, from the standpoint of present astronomical knowledge, it is tenable, will not here be discussed**"

Albert Einstein, *Cosmological Considerations on theGeneral Theory of Relativity*, Dover Pub., 1923, p. 183&188


You are here

"Einstein's asumption of homogeneity had three profound effects on cosmology. **First**, it introduced the idea of a finite universe, which resuscitated the medieval cosmos – previously considered obsolete and antithetical to science itself (*continued*).

Eric Lerner, *The Big Bang Never Happened*, Times Books, Random House, 1991

Second, the aesthetic simplicity of the assumption of homogeneity, combined with Einstein's prestige, embedded this assumption in all future relativistic cosmology

(*continued*).

(*agy*)

Third, and perhaps most significant, it set a precedent by allowing the introduction of assumptions contrary to observations, in the hope that further observations will justify the assumption. In the case of Einstein's cosmology it was the hope that, on scales larger than clusters and superclusters of galaxies, the universe would become smooth"

Eric Lerner, *The Big Bang Never Happened*, Times Books, Random House, 1991

‘We replaced scientific certainty with scientific progress’

Richard Feynman

“The Concordance Model (**ΛCDM**) is based upon the general theory of relativity (**GR**) and so it is important to ask just how well that theory is supported by observations and experiment. For example, how good is *Einstein Equivalence Principle*?”

(Questions of Modern Cosmology, p. 319) Malcolm Longair

Accelerated expansion of the universe

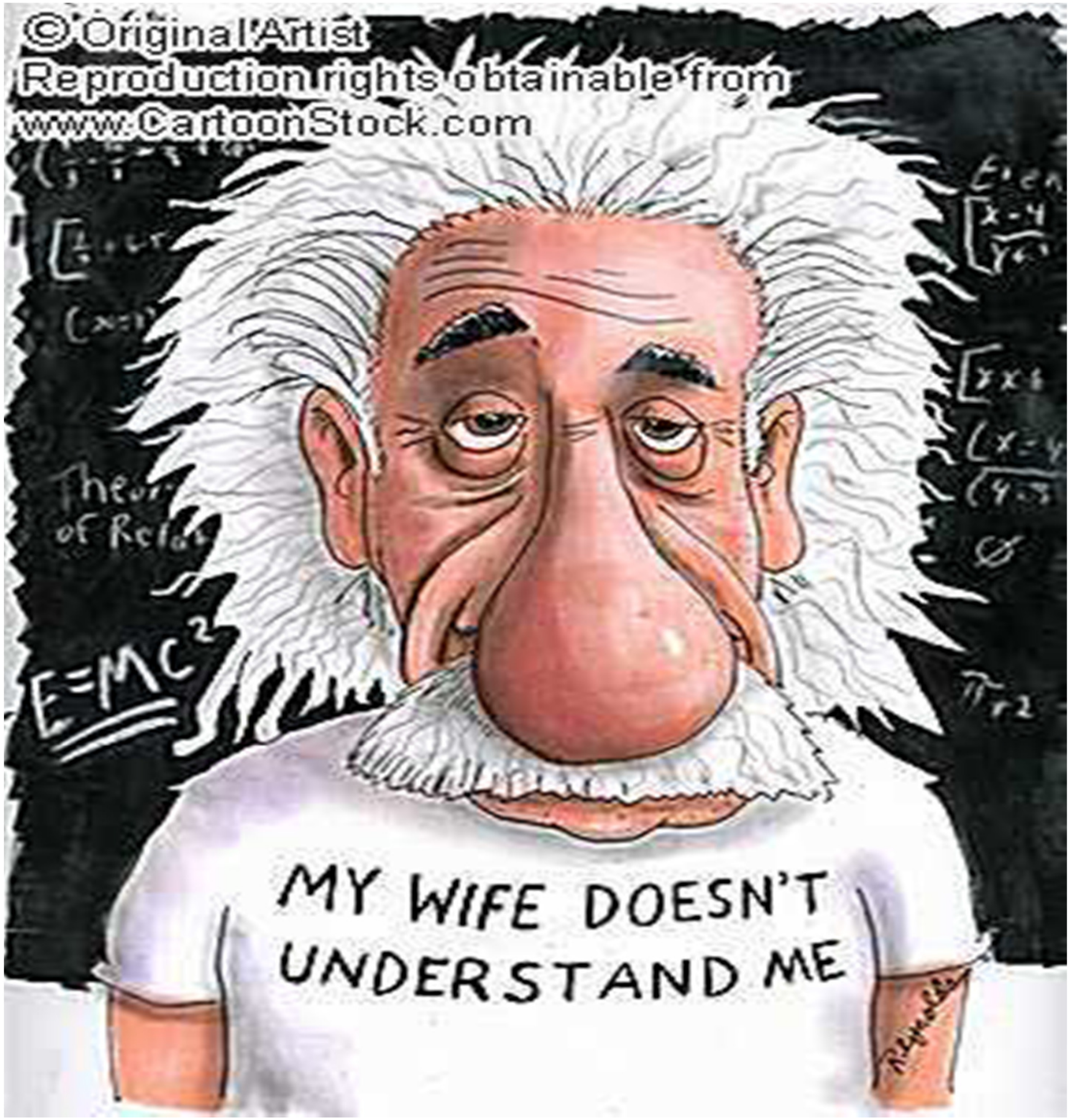
‘It is yet unclear whether the explanation of the fact that gravity becomes repulsive on large scales should be found within general relativity or within a new theory of gravitation’.

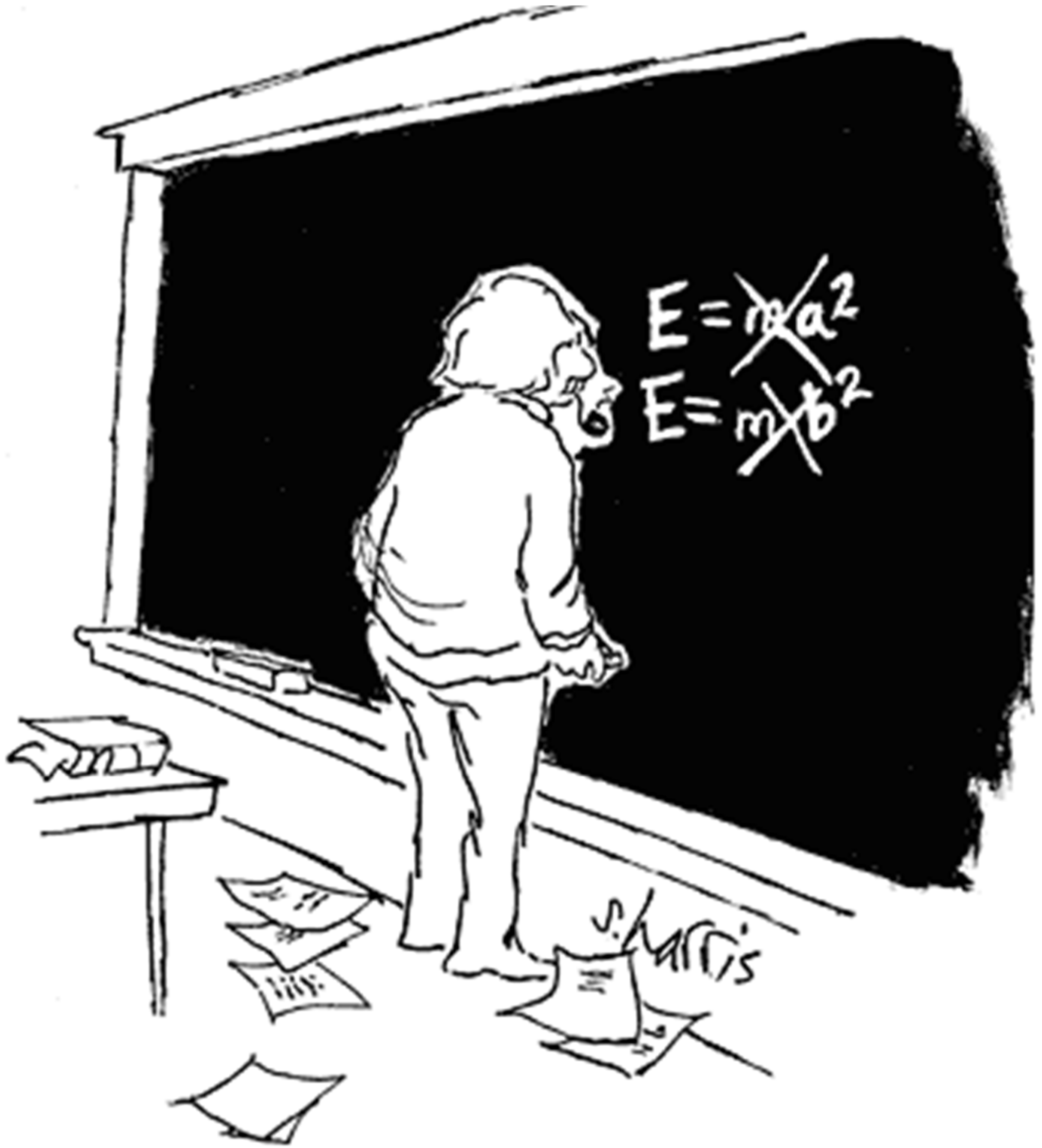
Alain Blanchard, Evidence for the Fifth Element,
Astronomy and Astrophysics Reviews (2010) 18:595–645

“**Modesty is the best policy**”

“Evidently”, writes Einstein himself in a letter addressed to the Magazine Science, “evidently, if Dr. Miller’s results should be confirmed, then the special relativity theory, and with it the general theory in its present form, fails. Experiment is the supreme judge.” “But”, adds Einstein, “we must take into account the fact that no theory exists outside the theory of relativity and the similar Lorentz theory which, except for the Miller experiment, explains all the known phenomena up to date”. And he concludes: ”Under the circumstances, nothing remains but to await a more complete publication of Miller’s results. Then it is to be hoped that a correct decision will develop”.

Emile Borel, *Space & Time*, Dover Pub. Inc., N.Y., 1960, p. 189


© Original Artist
Reproduction rights obtainable from
www.CartoonStock.com
E=MC2
MY WIFE DOESN'T
UNDERSTAND ME


E = ma²
E = mb²
S. Harris

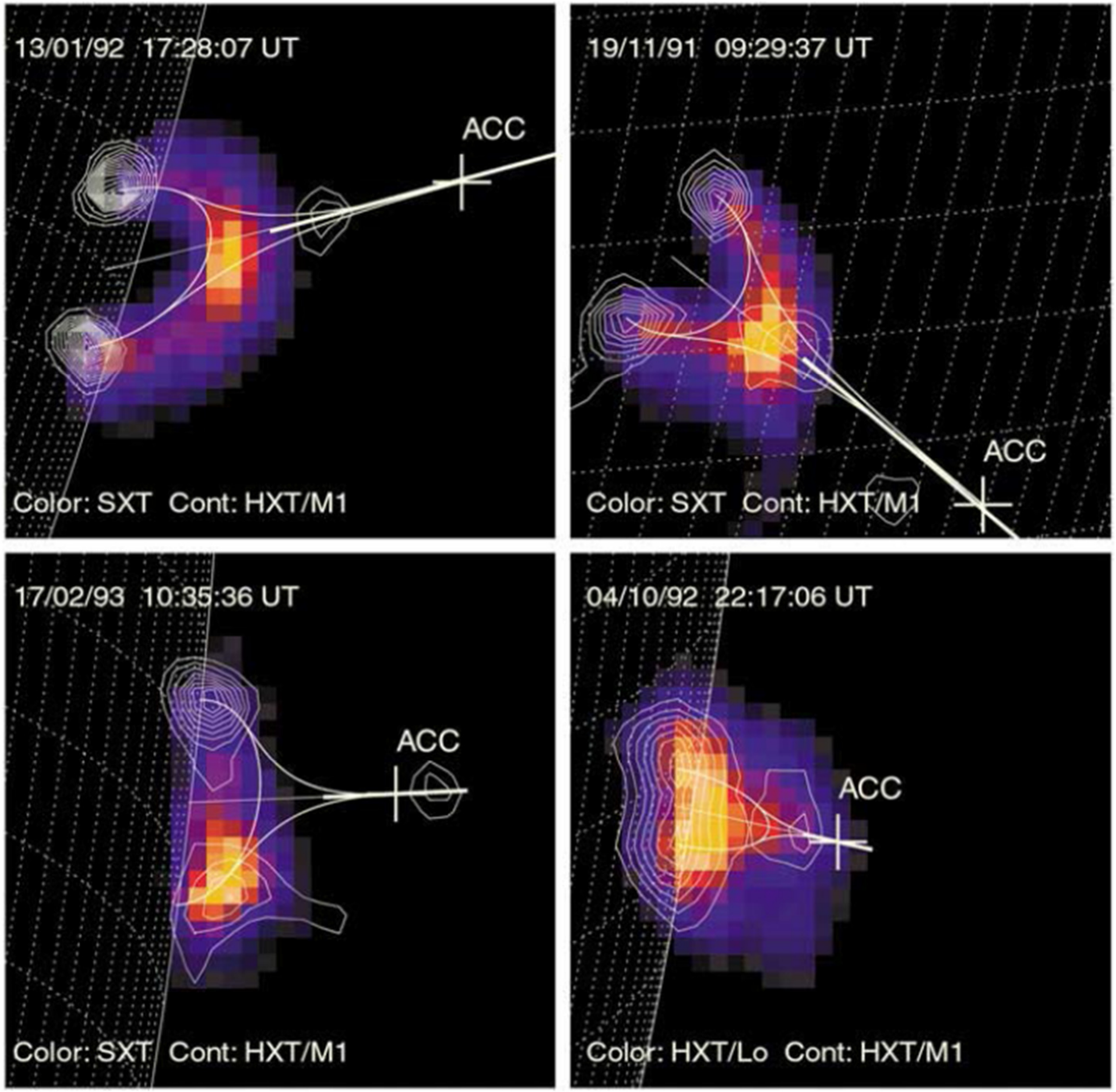
“Since the mathematicians have invaded the theory of relativity, I do not understand it myself anymore”.

Albert Einstein

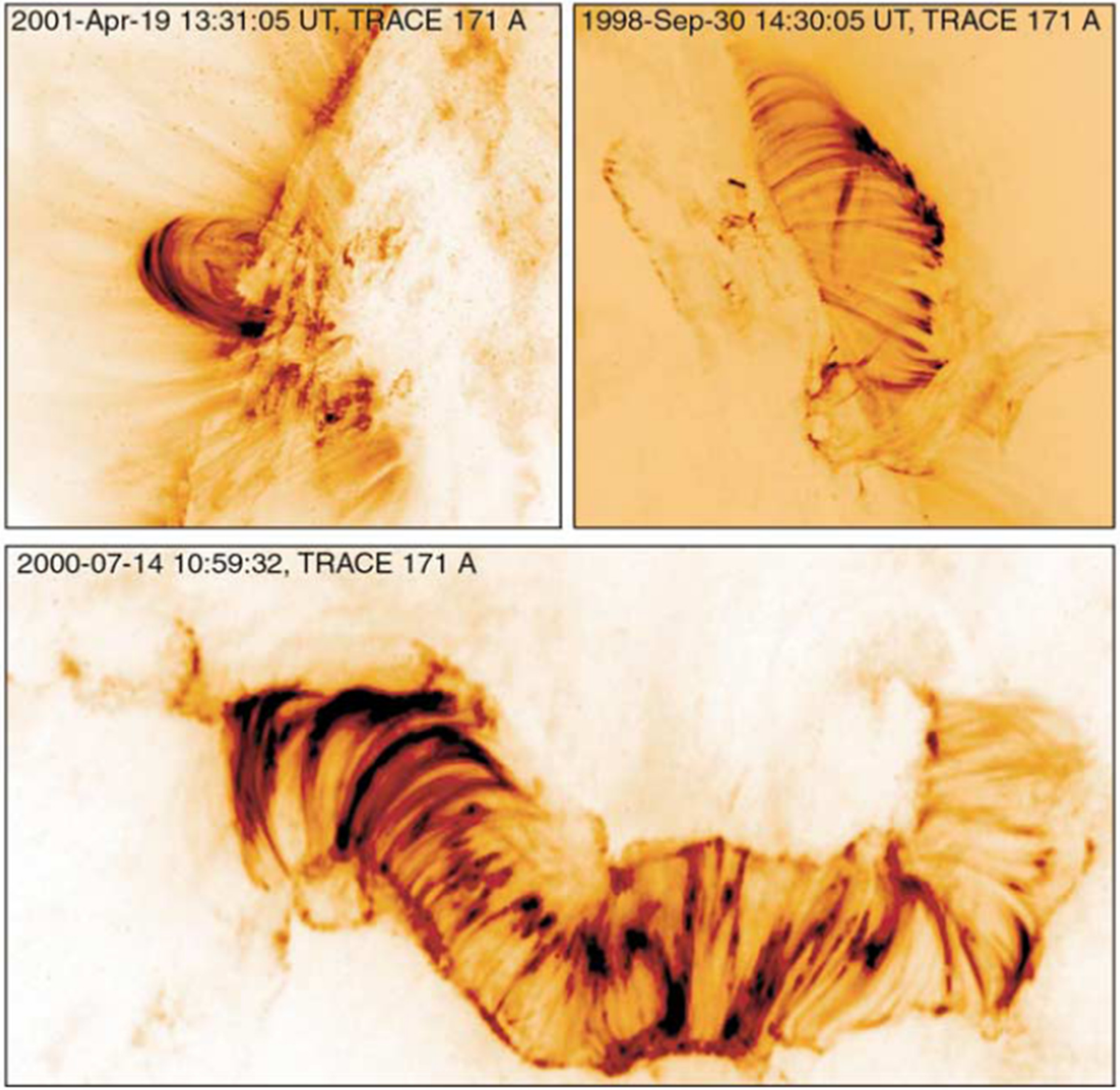

Abidin Dino
Home Sweet Home

Güneş Flare Olayında Manyetik Erkenin Korunumu

Küçük tınıs açılı parçacıklar ilmiğin ayakuçlarında Sert X-Işın Bölgeleri oluşturur.



Space Science Reviews **101:** 1–227, 2002.



Space Science Reviews **101:** 1–227, 2002.

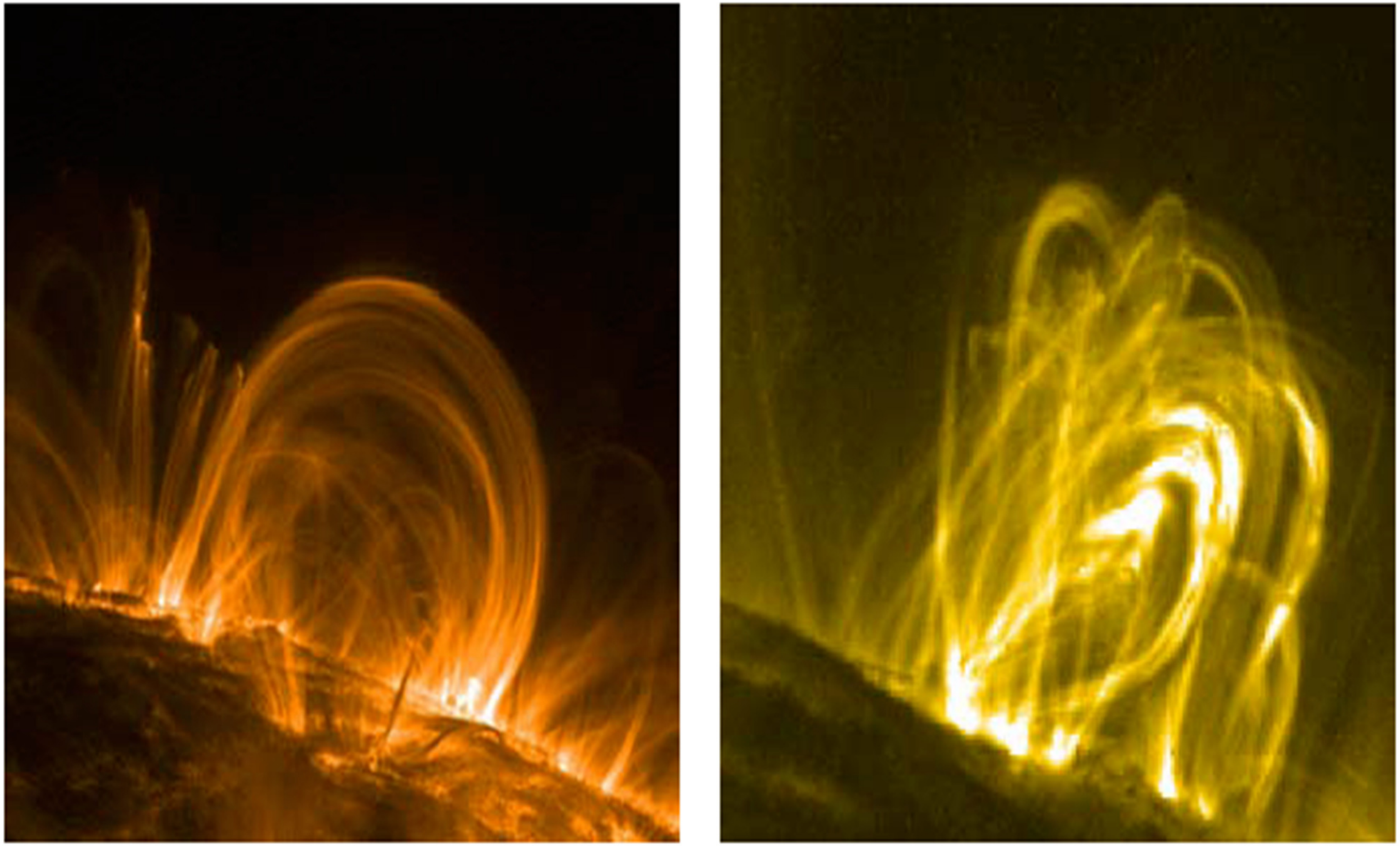
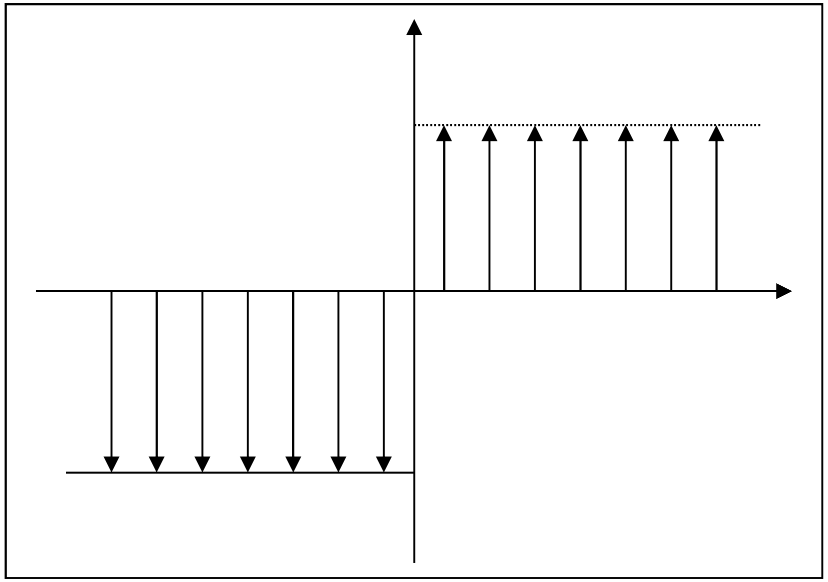


Fig. 14. *Left:* Example of a solar coronal loop system observed by *TRACE*. *Right:* Flaring loop system (observation by *TRACE* at 171Å). Although these images show the emission from relatively cool coronal plasma, they illustrate the possible complexity of magnetic fields

The Astron Astrophys Rev (2004) 12: 71–237

$$B(x,0)=\begin{cases}+B_0 & x>0\\ -B_0 & x<0\end{cases}$$

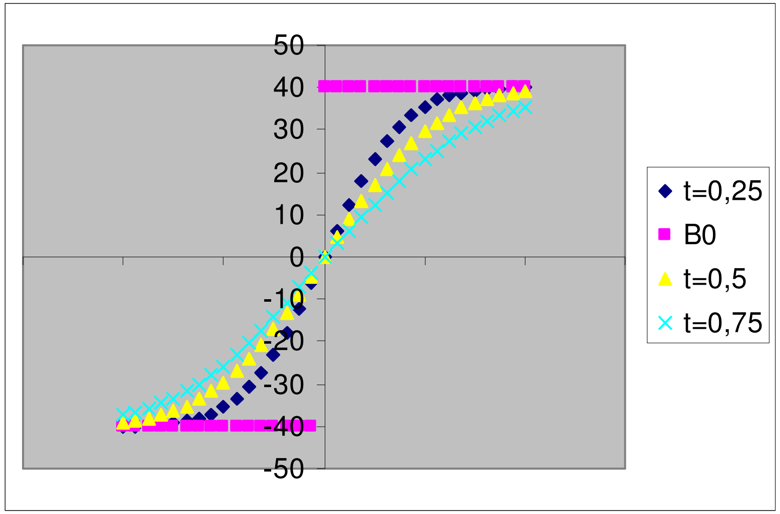


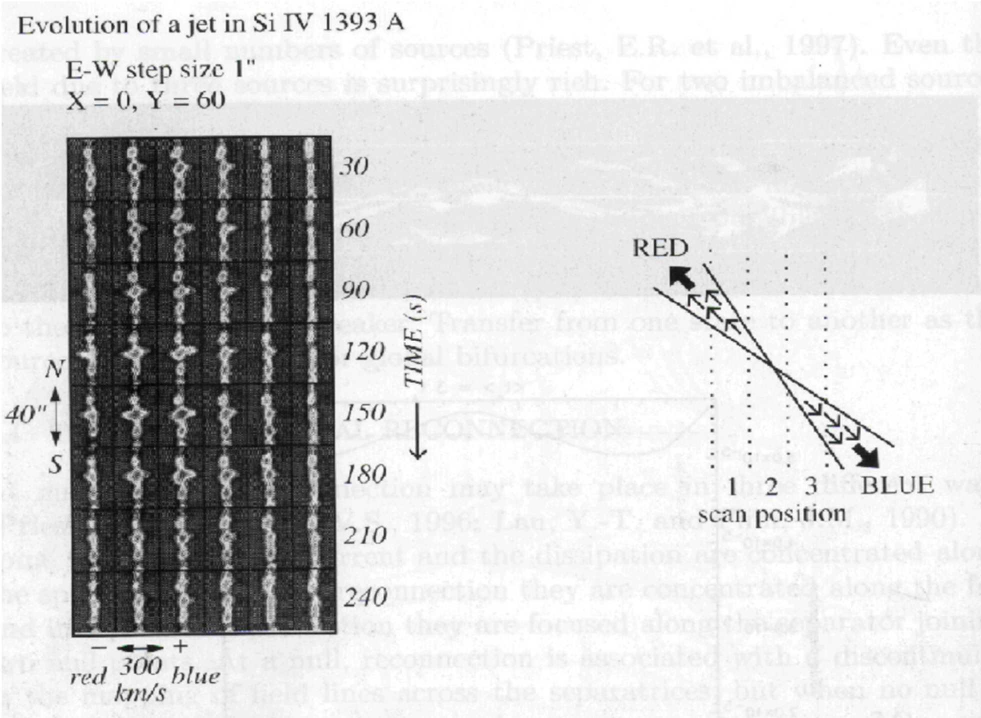
$$\frac{\partial B}{\partial t}=\eta\frac{\partial^2 B}{\partial x^2}$$

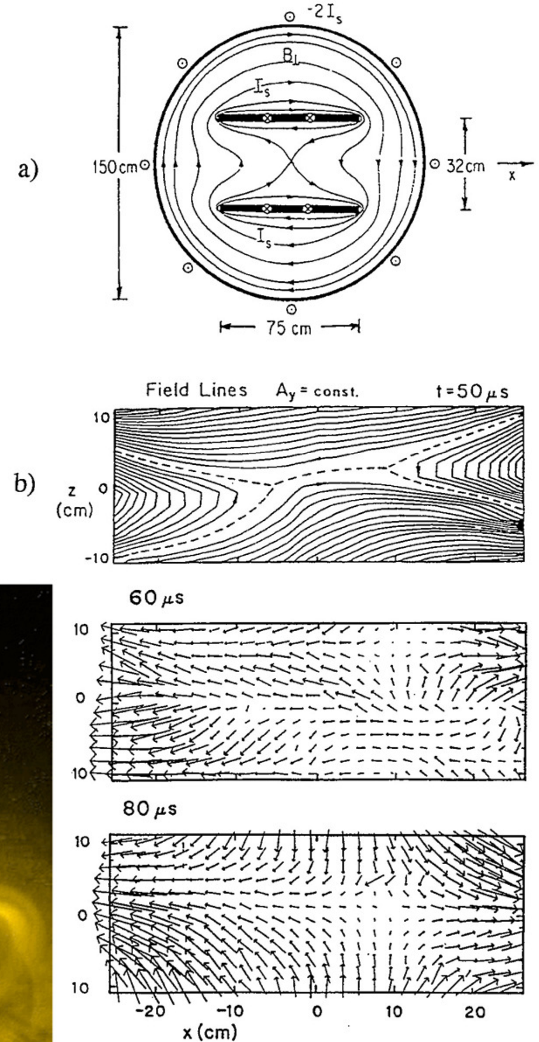
B(x , t) = B0 erf (ξ)

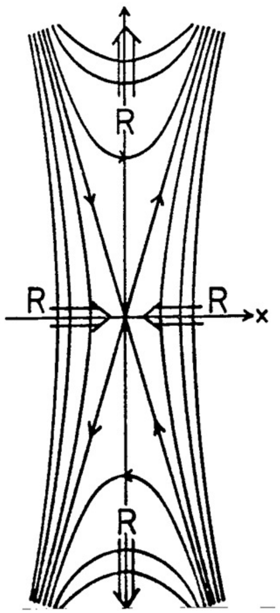
ξ = x / (4η t)1/2

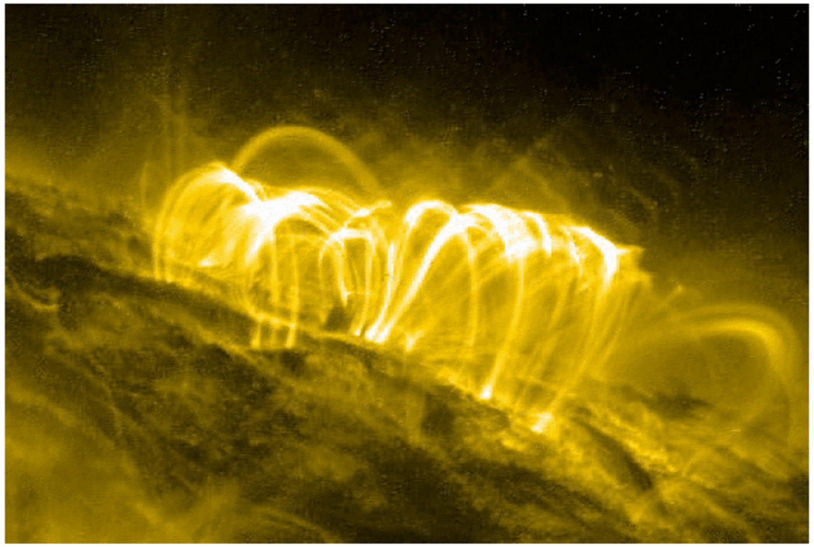
$$erf(\xi)=\frac{2}{\sqrt{\pi}}\int_0^{\xi}e^{-u^2}du \quad =\frac{2}{\sqrt{\pi}}\left(\xi-\frac{1}{3}\xi^3+\frac{1}{2!5}\xi^5-...\right)$$




Evolution of a jet in Si IV 1393 A
E-W step size 1"
X = 0, Y = 60
30
60
90
120
150
180
210
240
TIME (s)
N
40"
S
− 300 +
red km/s blue
RED
BLUE
1 2 3
scan position


a)
-2Is
BL
Is
150cm
32cm
x
75 cm
b)
Field Lines Ay = const. t=50 μs
10
0
-10
z
(cm)
60 μs
80 μs
-20
-10
0
10
20
x (cm)


R
R
R
x
R

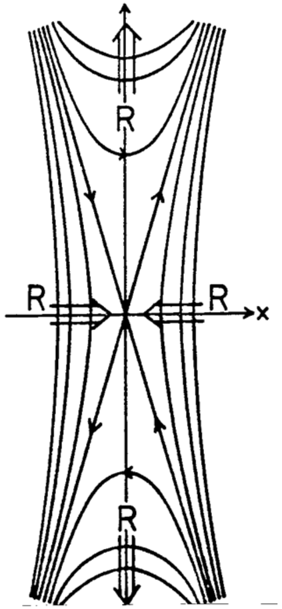


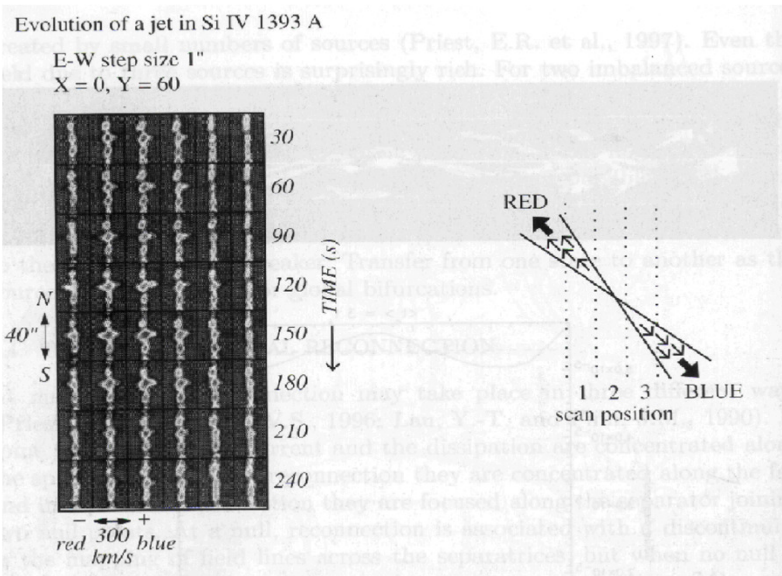
MB Eşitliğinin Üçüncü Momenti(3)

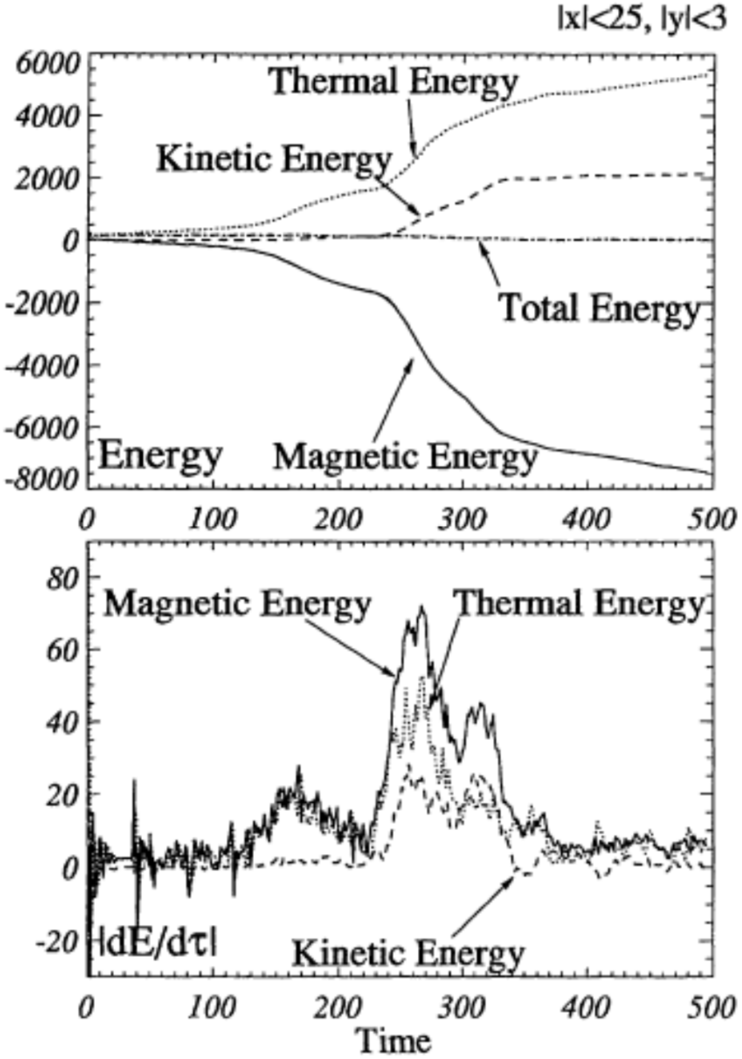
$$\frac{\partial}{\partial t}\left(\frac{B^2}{2\mu_0}\right)+\nabla\cdot\left(\boldsymbol{E}\times\boldsymbol{H}\right)=-\mu_0\eta\,|\,\boldsymbol{j}\,|^2-\boldsymbol{v}\cdot\left(\boldsymbol{j}\times\boldsymbol{B}\right)$$

$$\left|\boldsymbol{E}\times\boldsymbol{H}\right|=\frac{B^2}{\mu}\boldsymbol{v}$$

$$\frac{\partial}{\partial t}\left(\frac{B^2}{2\mu_0}\right)+\nabla\cdot\left(\frac{B^2}{\mu}\boldsymbol{v}\right)=-\mu_0\eta|\boldsymbol{j}|^2-\boldsymbol{v}\cdot\left(\boldsymbol{j}\times\boldsymbol{B}\right)$$







$$\frac{\partial}{\partial t}\left(\frac{B^2}{2\mu_0}\right)+\nabla\cdot(\boldsymbol{E}\times\boldsymbol{H})=-\mu_0\eta|\boldsymbol{j}|^2-\boldsymbol{v}\cdot(\boldsymbol{j}\times\boldsymbol{B})$$

$$|\boldsymbol{E}\times\boldsymbol{H}|=\frac{B^2}{\mu}\boldsymbol{v}$$

$$\frac{\partial}{\partial t}\left(\frac{B^2}{2\mu_0}\right)+\nabla\cdot\left(\frac{B^2}{\mu}\boldsymbol{v}\right)=-\mu_0\eta|\boldsymbol{j}|^2-\boldsymbol{v}\cdot(\boldsymbol{j}\times\boldsymbol{B})$$

PASJ, 51, 161-71, 1999

KORUNUM / SÜREKLİLİK / TAŞINIM EŞİTLİKLERİ

How to extract the Physics from them

and/or

How to bury the Physics into them

f evre – uzay yoğunluğu (phase-space density)

$$f(x, y, z, v_x, v_y, v_z, t)$$

$$df\,/\,dt = ?$$

$$\frac{df}{dt} = \frac{\partial f}{\partial t} + \frac{\partial f}{\partial x}\frac{\partial x}{\partial t} + \frac{\partial f}{\partial y}\frac{\partial y}{\partial t} + \frac{\partial f}{\partial z}\frac{\partial z}{\partial t} + \frac{\partial f}{\partial v_x}\frac{\partial v_x}{\partial t} + \frac{\partial f}{\partial v_y}\frac{\partial v_y}{\partial t} + \frac{\partial f}{\partial v_z}\frac{\partial v_z}{\partial t} = 0$$

$$\frac{\partial f}{\partial t} + \frac{\partial f}{\partial x}v_x + \frac{\partial f}{\partial y}v_y + \frac{\partial f}{\partial z}v_z + \frac{\partial f}{\partial v_x}\frac{F_x}{m} + \frac{\partial f}{\partial v_y}\frac{F_y}{m} + \frac{\partial f}{\partial v_z}\frac{F_z}{m} = 0$$

Maxwell Boltzmann Eşitliği

$$\frac{\partial}{\partial t} f(\boldsymbol{r},\boldsymbol{u},t) + (\boldsymbol{u}\cdot\nabla_{\boldsymbol{r}}) f(\boldsymbol{r},\boldsymbol{u},t) + \left(\frac{\boldsymbol{F}}{m}\cdot\nabla_{\boldsymbol{u}}\right) f(\boldsymbol{r},\boldsymbol{u},t) = \left(\frac{\partial f}{\partial t}\right)_{çarp}$$

- Durgun durum (steady state) $\partial f / \partial t = 0$
- Eşdağılımlı (homogeneous) $\boldsymbol{u}\,.\nabla_r f = 0$
- Çarpışmasız (collisionless) $(\partial f / \partial t\,)_{çarp} = 0$
- Yönbağımsız (isotropic) $(\boldsymbol{F}\,.\nabla_u) f = 0$

Maxwell Boltzmann Eşitliğinin Hız Momentlerinin Türetilmesi

- $g(\mathbf{u}) = m\, u^{0} = m$
- $g(\mathbf{u}) = m\, u^{1} = m\, u$
- $g(\mathbf{u}) = m\, u^{2} = m\, u^{2}$
- $g(\mathbf{u}) = m\, u^{3} = m\, u^{3}$
- …

$$\int g(\boldsymbol{u}) \frac{\partial}{\partial t} f(\boldsymbol{r},\boldsymbol{u},t)\, d\boldsymbol{u} + \int g(\boldsymbol{u})(\boldsymbol{u}\cdot\nabla_r) f(\boldsymbol{r},\boldsymbol{u},t)\, d\boldsymbol{u} + \int g(\boldsymbol{u})\left(\frac{\boldsymbol{F}}{m}\cdot\nabla_u\right) f(\boldsymbol{r},\boldsymbol{u},t)\, d\boldsymbol{u} = \int g(\boldsymbol{u})\left(\frac{\partial f}{\partial t}\right)_{çarp} d\boldsymbol{u}$$

MHD Eşitlikleri

$$\frac{\partial \rho}{\partial t} + \nabla \cdot (\rho \boldsymbol{v}) = 0$$

$$\rho\left[\frac{\partial}{\partial t} + (\boldsymbol{v} \cdot \nabla)\right]\boldsymbol{v} = -\nabla\left(P + \frac{B^2}{8\pi}\right) - \rho \nabla \Phi + \left(\frac{\boldsymbol{B}}{4\pi} \cdot \nabla\right)\boldsymbol{B} + \rho \nu \left[\nabla^2 \boldsymbol{v} + \frac{1}{3}\nabla(\nabla \cdot \boldsymbol{v})\right]$$

$$-2\rho \boldsymbol{\Omega} \times \boldsymbol{v} + \frac{1}{2}\rho \nabla \left| \boldsymbol{\Omega} \times \boldsymbol{r} \right|^2 + \rho \boldsymbol{r} \times \frac{d\boldsymbol{\Omega}}{d t}$$

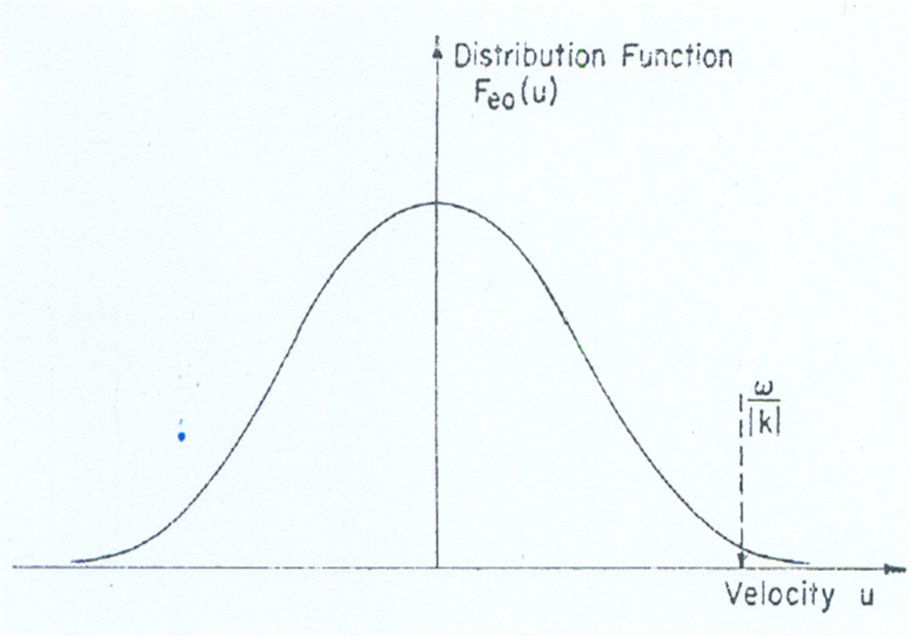
$$\rho T\left[\frac{\partial s}{\partial t} + \mathbf{v} \cdot \nabla\right] s = -\nabla \cdot \boldsymbol{q} - L_r + j^2 / \sigma + \rho \, \varepsilon_{nuclear} + H_\nu + H_w$$

E.R. Priest, *Solar Magnetohydrodynamics*, D. Reidel Pub. Co., Dordrecht, 1984

Korunum eşitliklerinin ‘standart’ biçimi

$$\frac{\partial}{\partial t}\left(Fiziksel\ niceliğin\ yoğunluğu\right)+\nabla\cdot\left(Fiziksel\ niceliğin\ akısı\right)=Kaynak-Batık$$

$$\frac{\partial Q}{\partial t}+\nabla\cdot\left(Q\mathbf{v}\right)=S-L$$



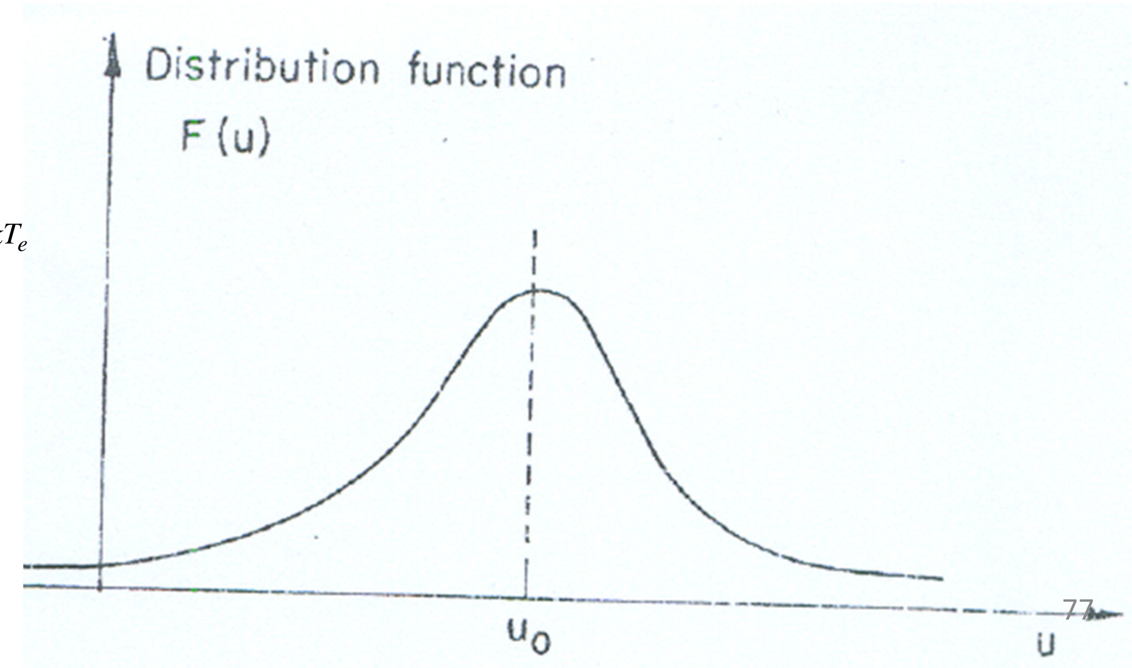
Maxwellian

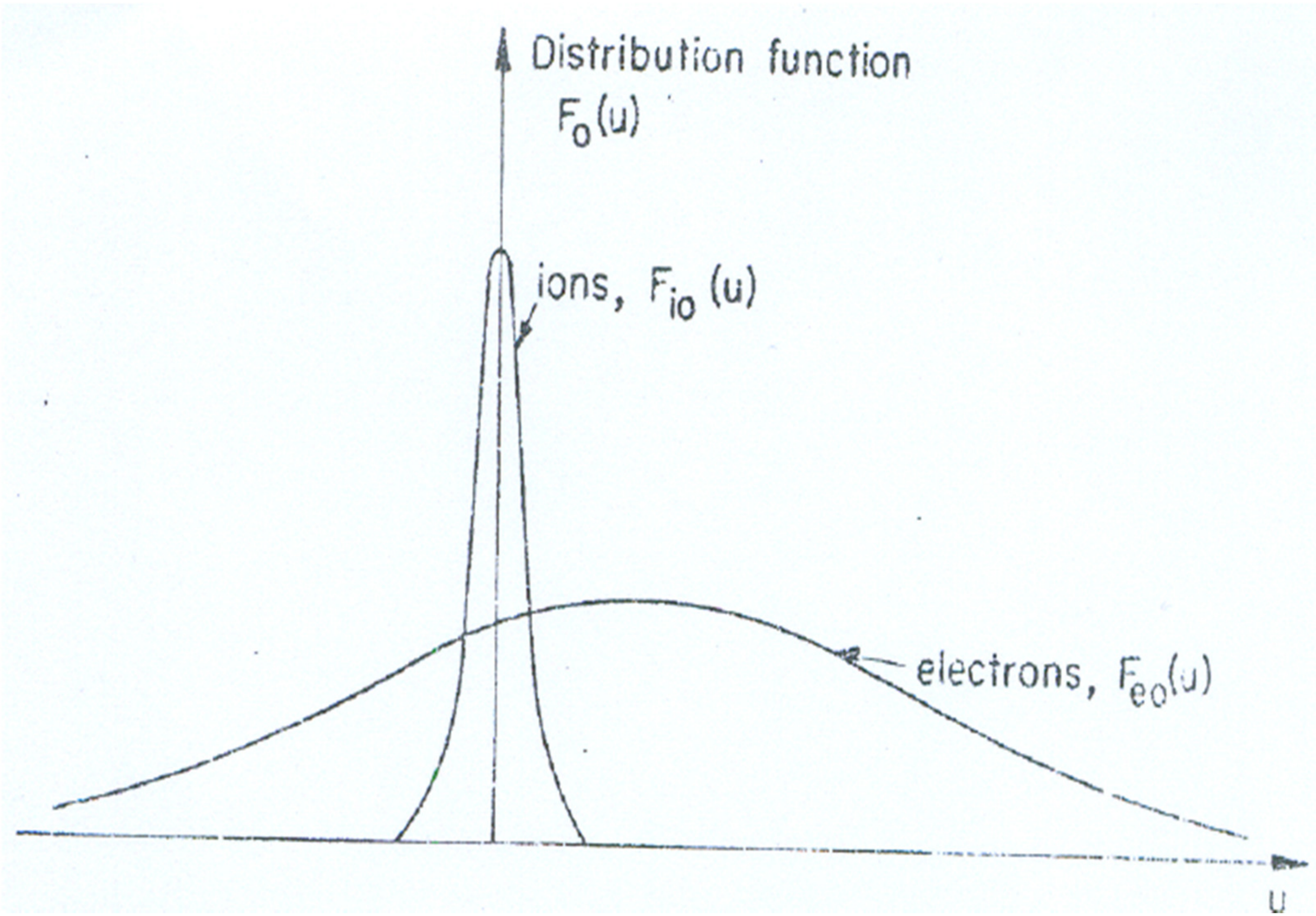
$$F_{i0} = \left(\frac{m_i}{2\pi kT_i} \right)^{1/2} e^{-m_i u^2 / 2kT_i}$$

Drifting Maxwellian

$$F_{e0} = \left(\frac{m_e}{2\pi kT_e} \right)^{1/2} e^{-m_e (u-u_0)^2 / 2kT_e}$$

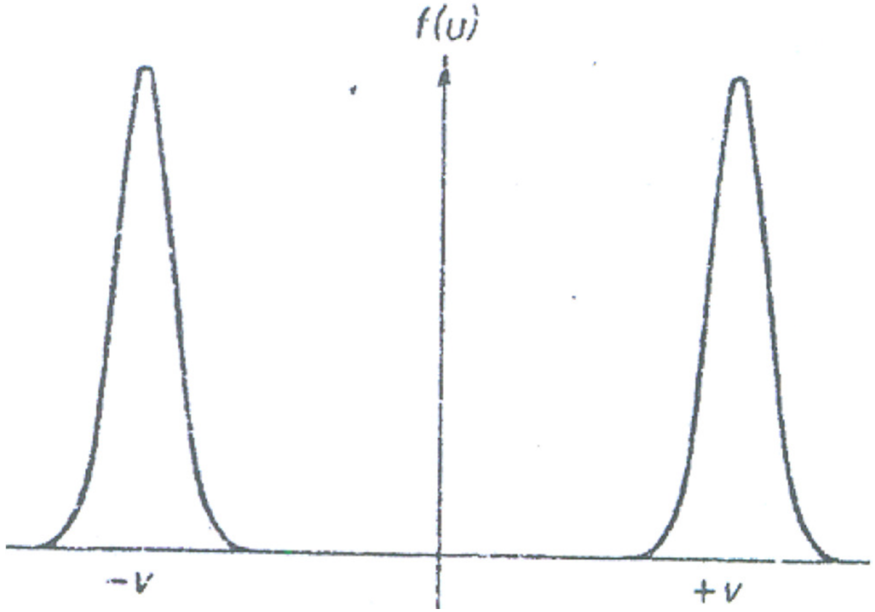
$$F_{i0} = \left(\frac{m_i}{2\pi kT_i} \right)^{1/2} e^{-m_i u^2 / 2kT_i}$$



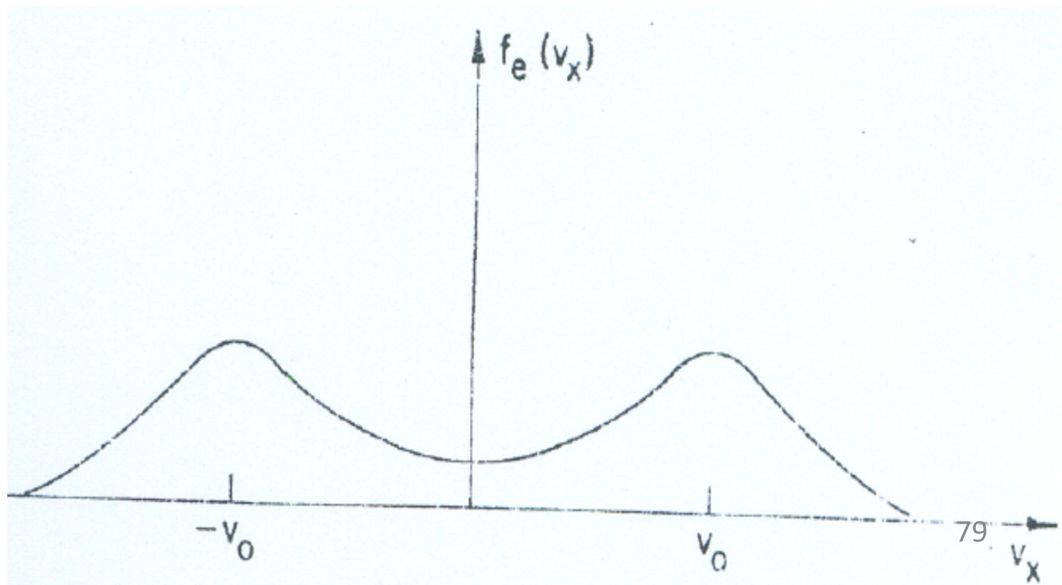


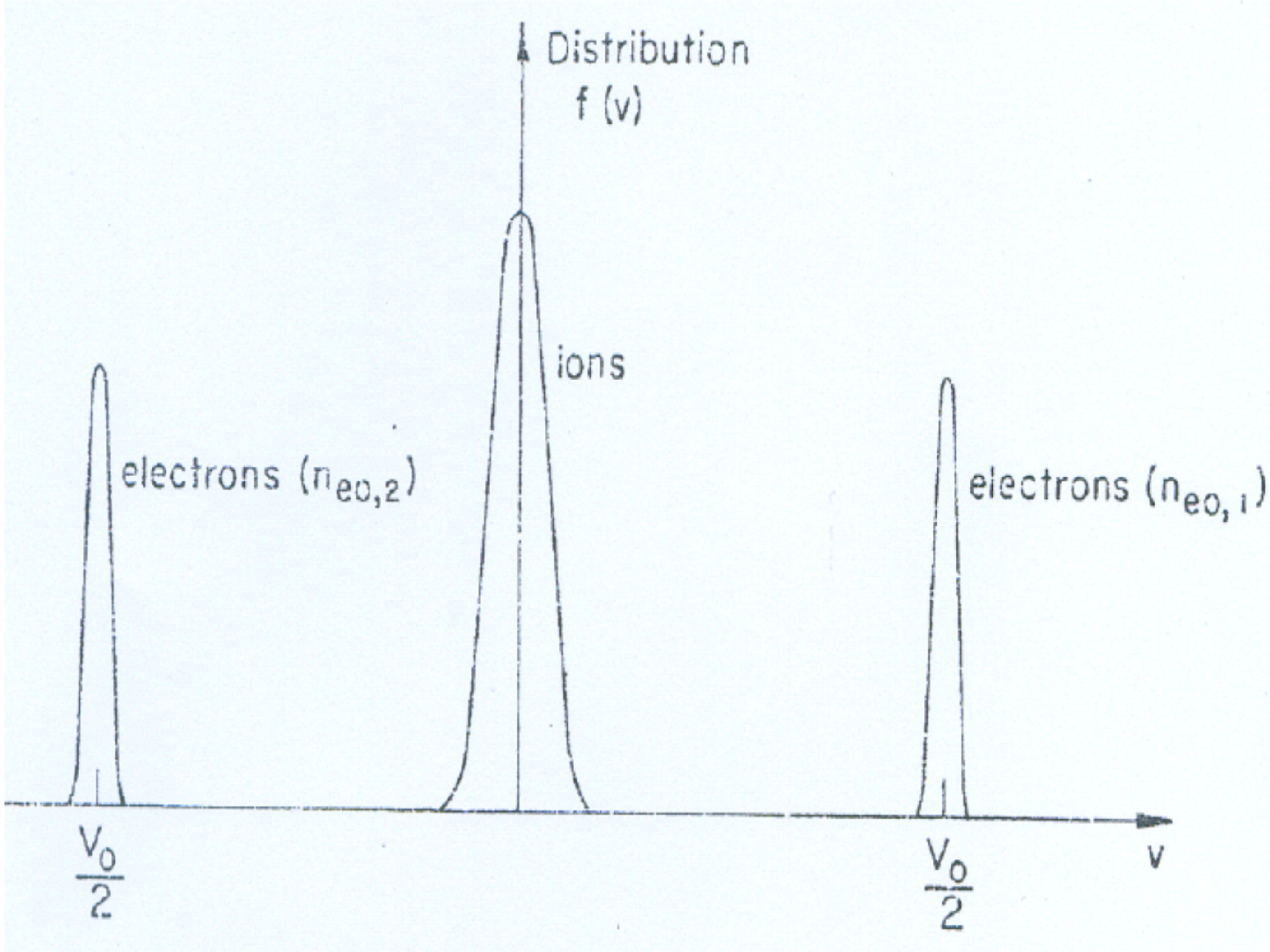
$$f_{0e} = \beta \, exp\left[-\alpha (v-u)^2\right] \qquad \alpha = m/2T$$

Warm electron stream drifting with a speed less than its thermal speed through a cold-ion distribution

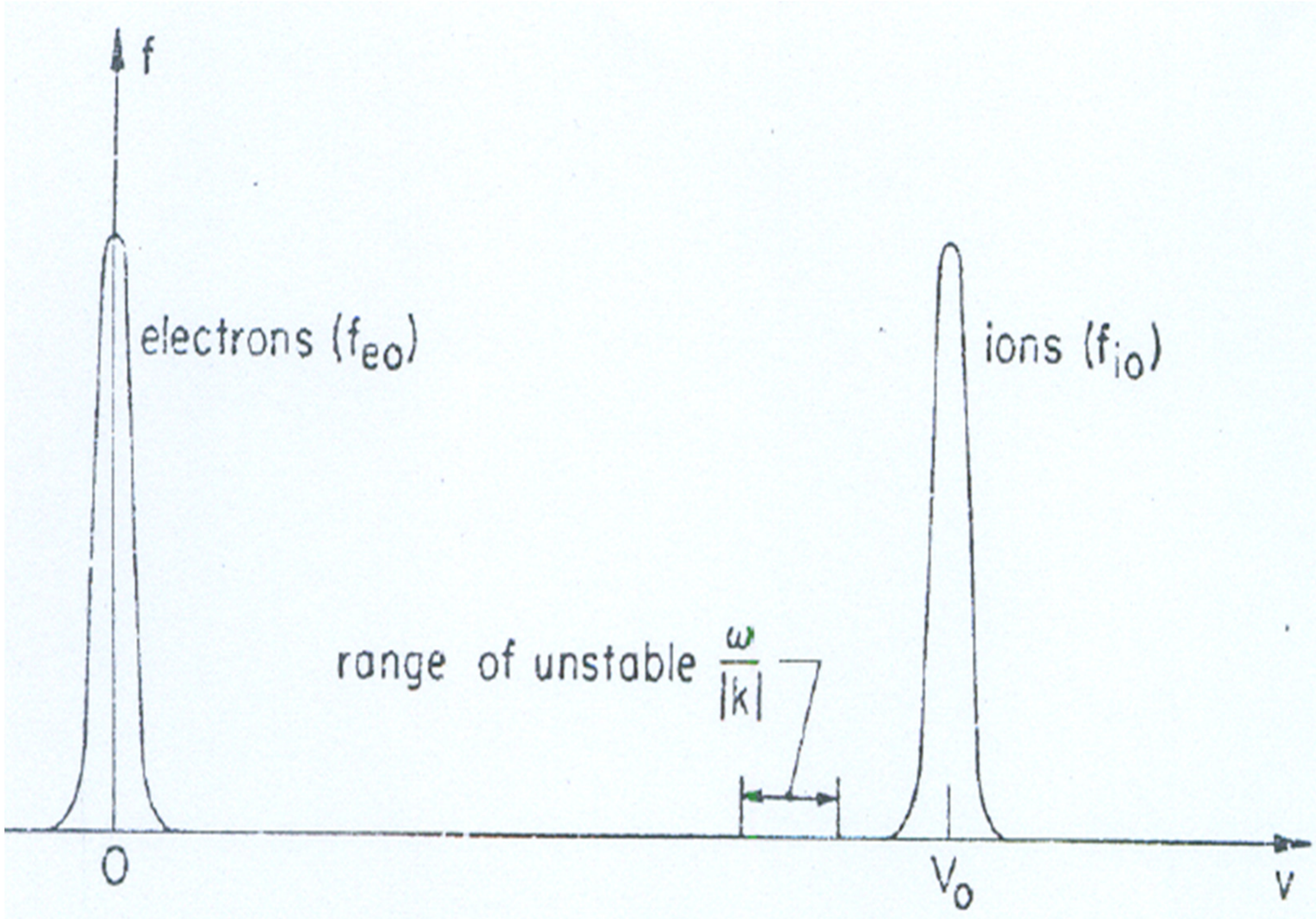


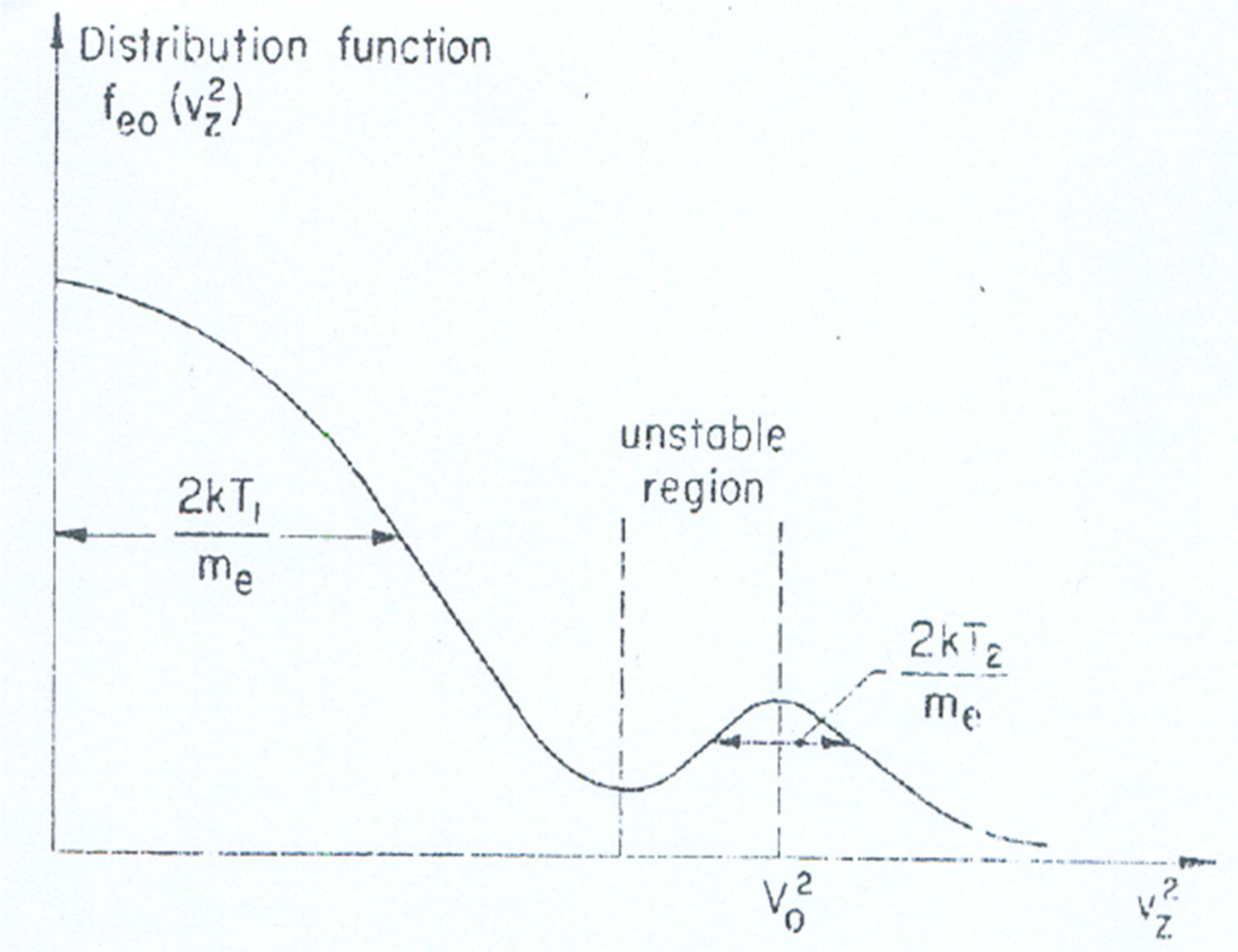
$$F_{e0}(u)=\frac{1}{2}\sqrt{\frac{m_e}{2\pi kT_e}}\left\{exp\left[-\frac{m_e(u-u_0)^2}{2kT_e}\right]+exp\left[-\frac{m_e(u+u_0)^2}{2kT_e}\right]\right\}$$

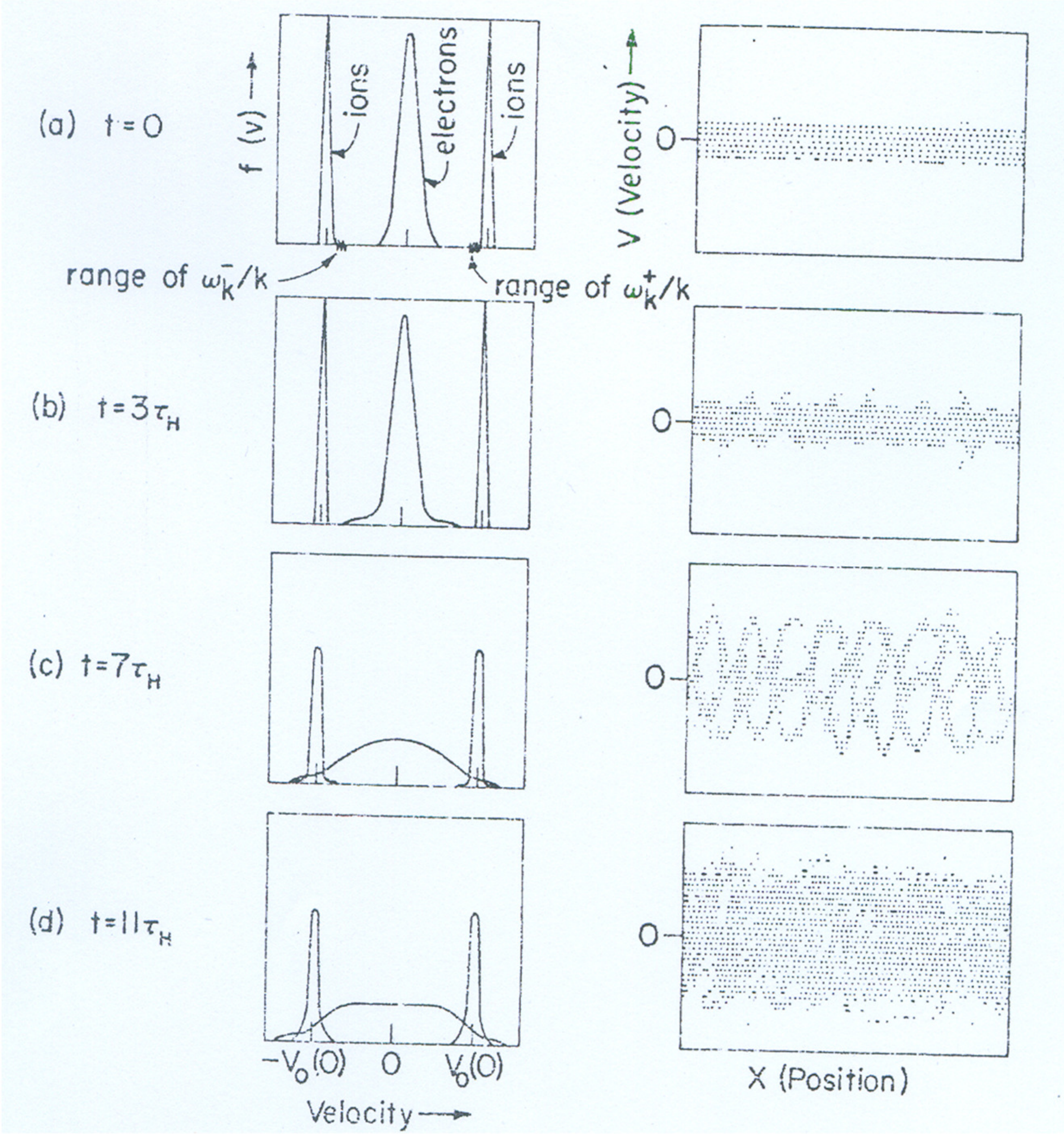




Distribution
f (v)
ions
electrons ($n_{eo,2}$)
electrons ($n_{eo,1}$)
$\frac{V_0}{2}$
$\frac{V_0}{2}$
v


f
electrons (f_{eo})
ions (f_{io})
range of unstable $\frac{\omega}{|k|}$
0
V_o
v


Distribution function
$f_{eo}(v_z^2)$
unstable region
$\frac{2kT_1}{m_e}$
$\frac{2kT_2}{m_e}$
V_0^2
v_z^2



(a) t=0
f (v) →
ions
electrons
ions
range of ω_k^-/k
range of ω_k^+/k
V (Velocity) →
0
(b) t=3τ_H
0
(c) t=7τ_H
0
(d) t=11τ_H
0
$-V_o(0)$ 0 $V_o(0)$
Velocity →
X (Position)

Doğrusal (Linear) & Doğrusal Olmayan (Non-linear)

Sonsuz kez diferansiyeli alınabilen gerçel veya kompleks bir $f(x)$ işlevinin gerçel veya kompleks bir 'a' sayısı komşuluğunda güç serisine açılımı (Taylor açılımı)

$$f(x) = f(a) + \frac{f'(a)}{1!}(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \ldots$$

☺ Peter's Taylor Expansion! ☺