Title: Physics Wiki (IT tools for Science)

Date: Sep 09, 2008 06:20 PM

URL: http://pirsa.org/08090057

Abstract: A wiki is an excellent tool for organizing and representing human knowledge. By building a personal wiki notebook, a scientific researcher may optimally organize past and current research notes. In this brief practical introduction I will provide a guided tour of an open scientific notebook -- physicswiki.org -- and discuss the design considerations, features, and content of this open source wiki.

Advantages of a Wiki

- natural concept organization
  - many interlinked concepts
  - ideal for research notes (rapid edittttttting)
- educational tool
  - deep definitions
- open source science
  - or private notebook
  - collaboration
  - portable

Advantages of a Wiki

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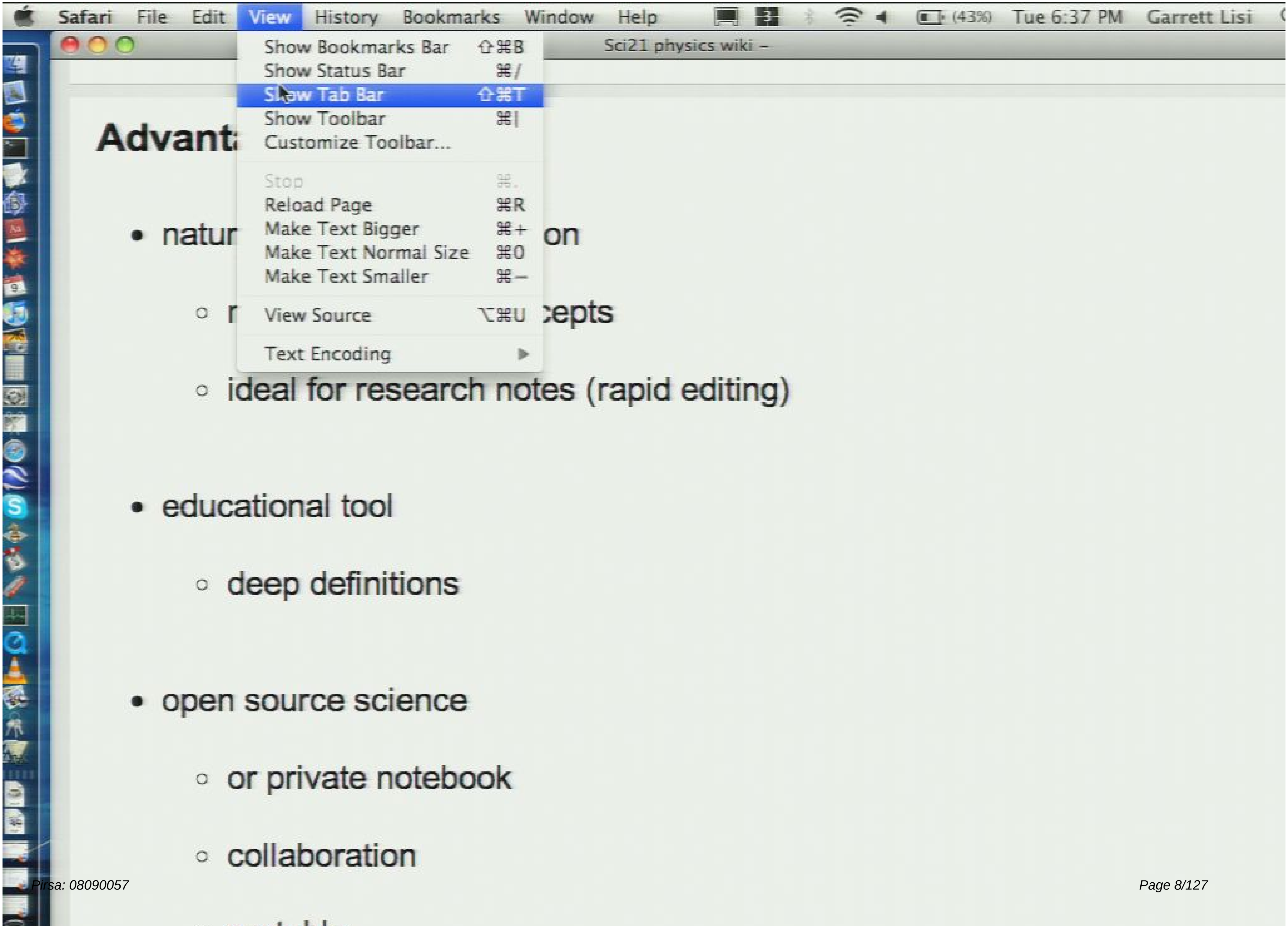
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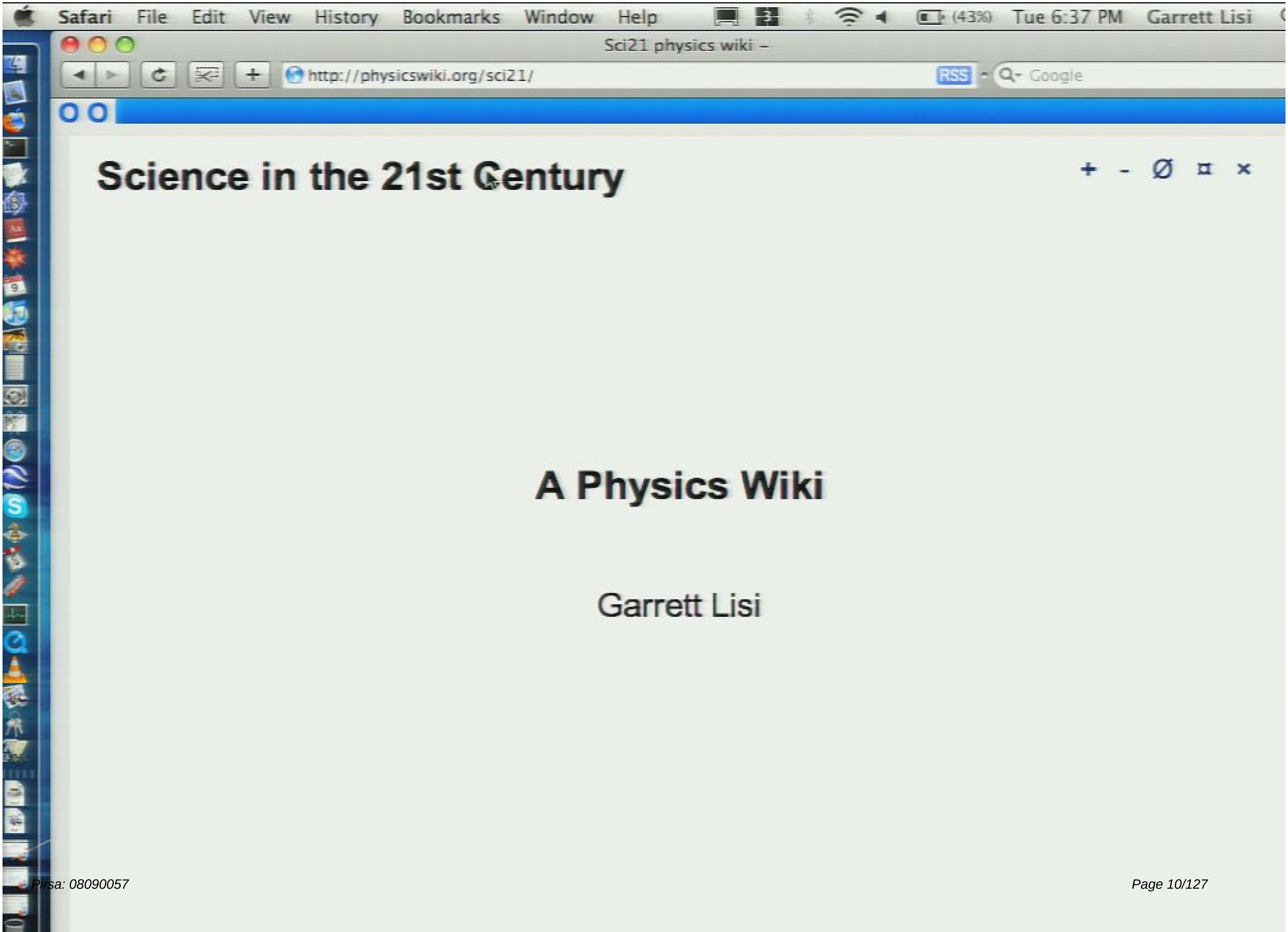
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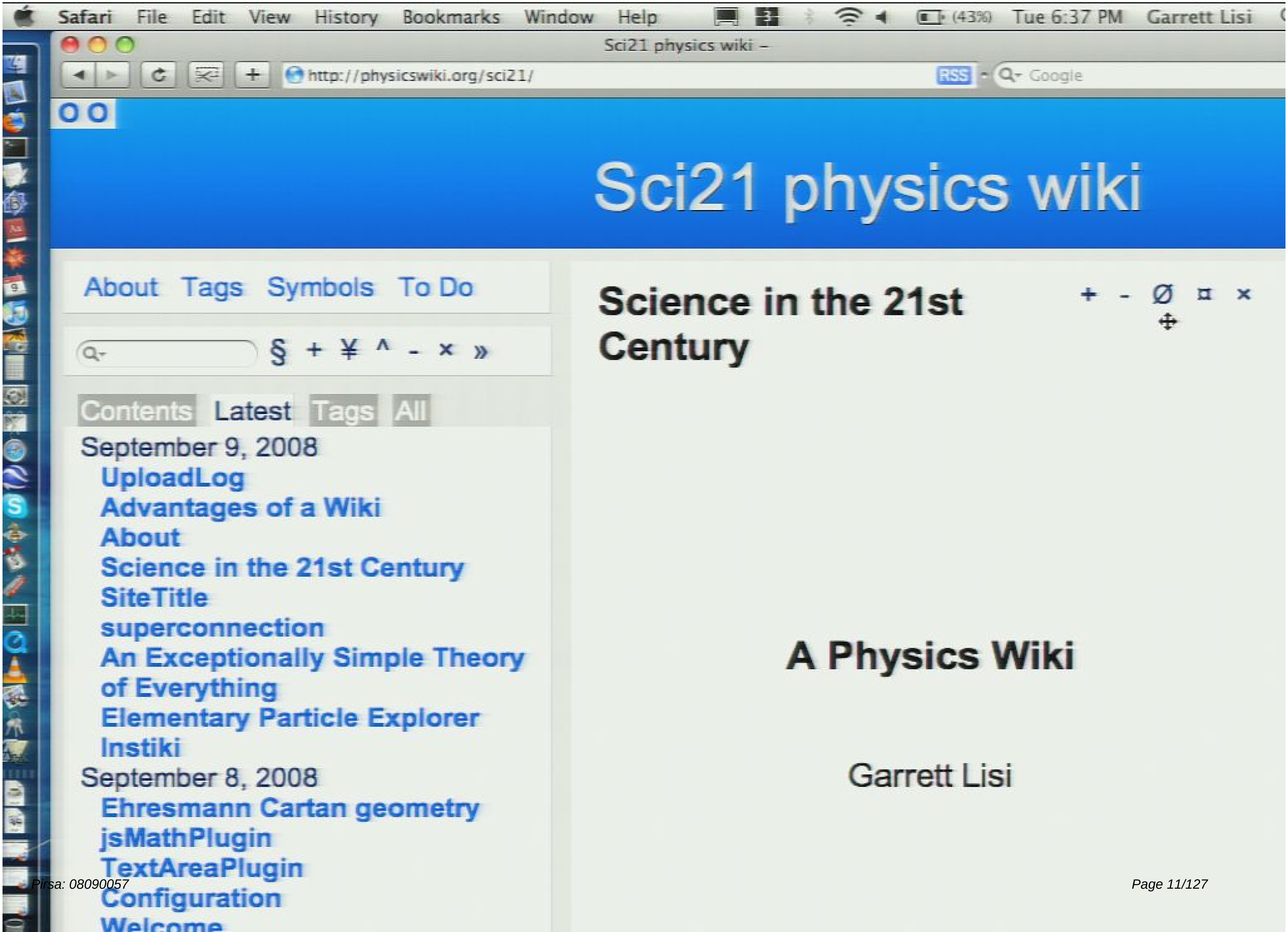
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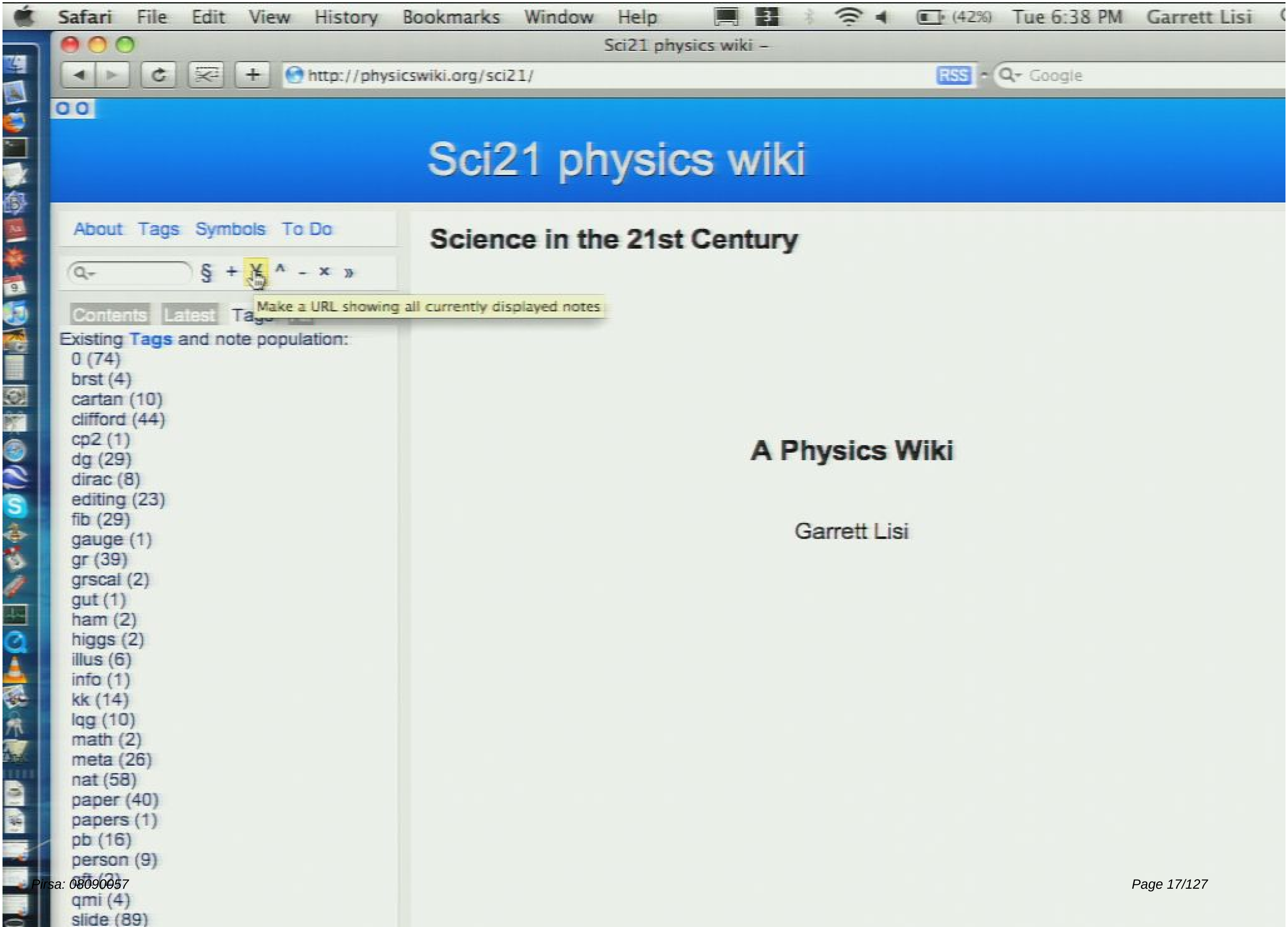
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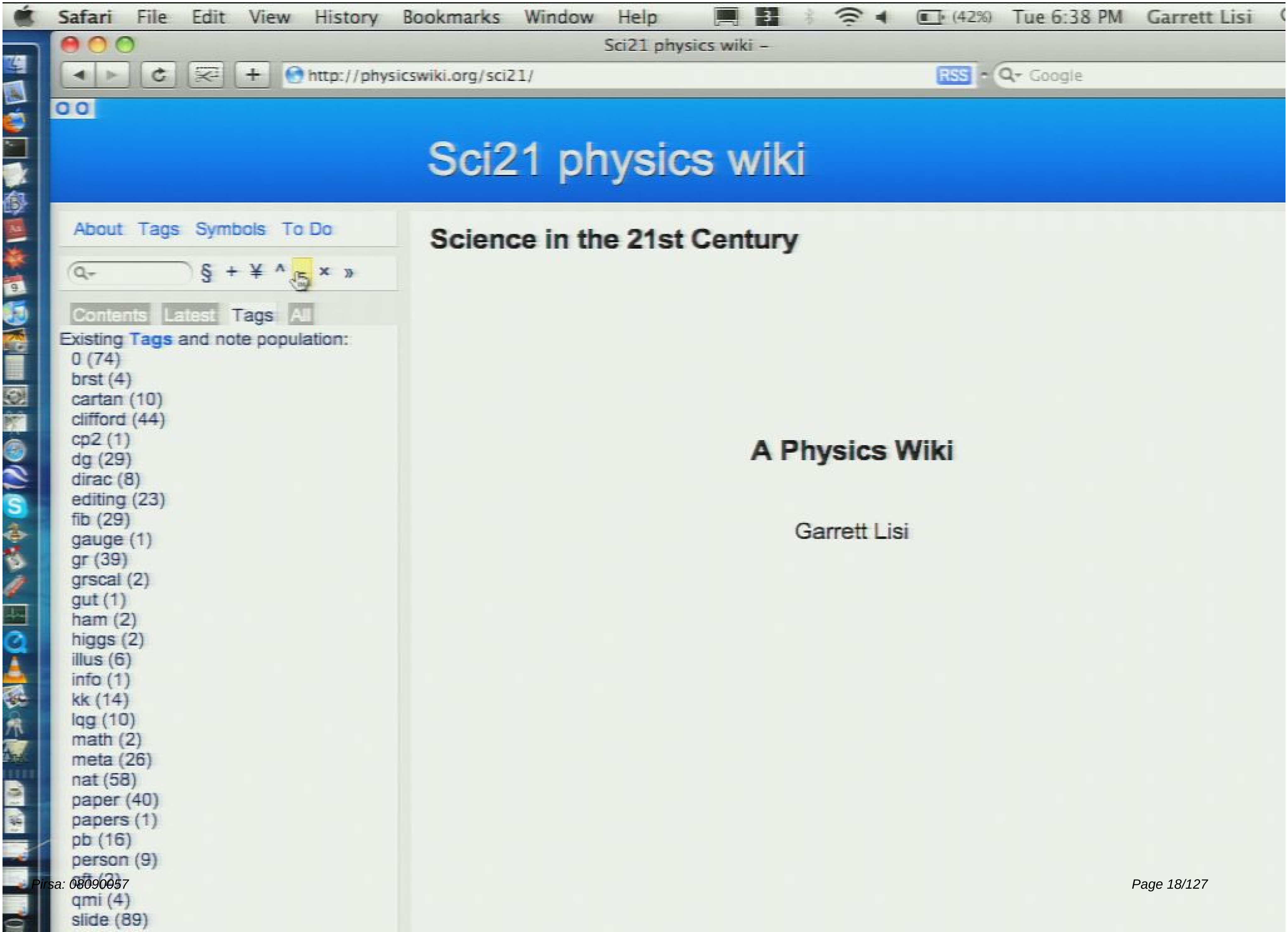
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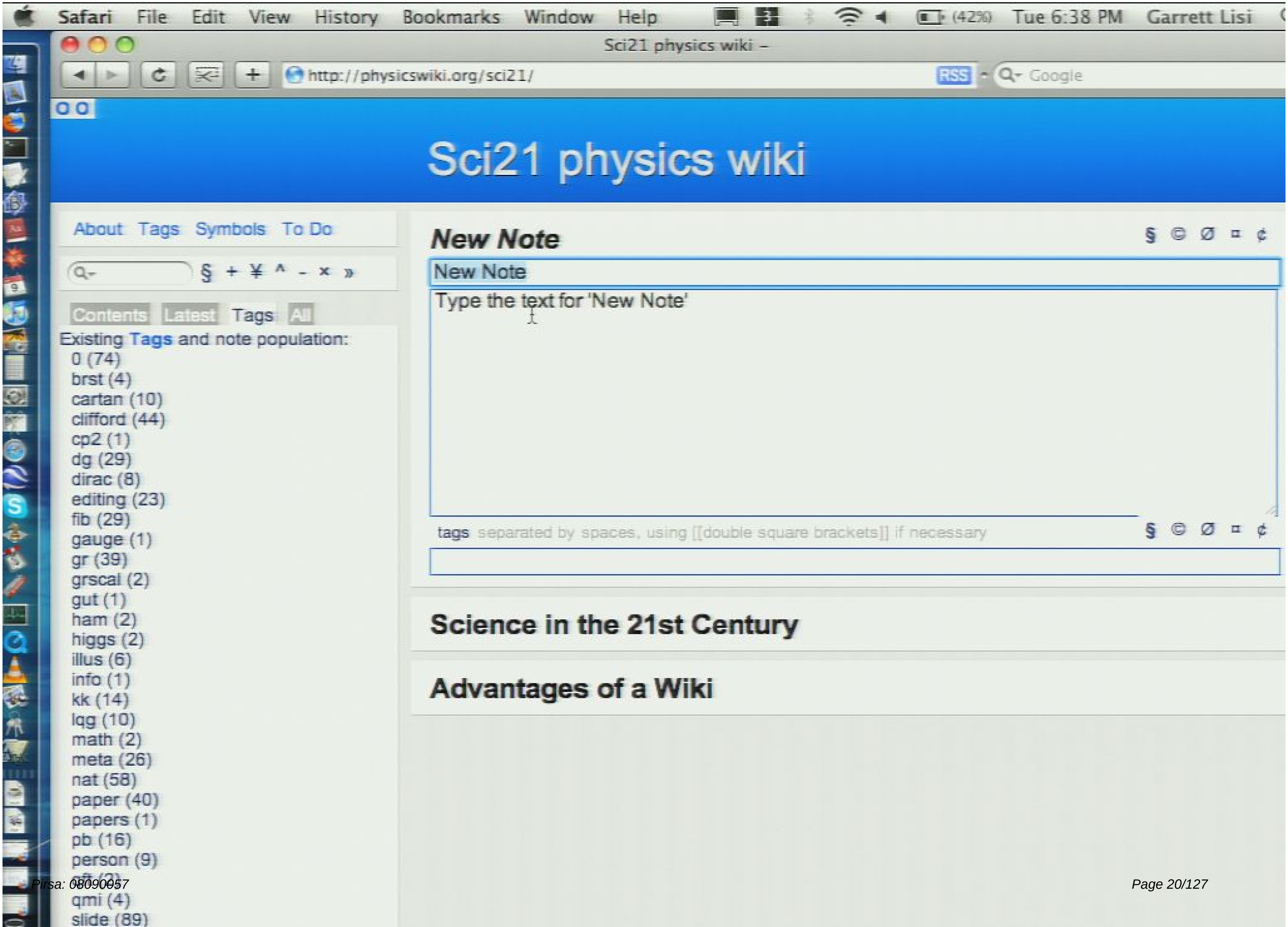
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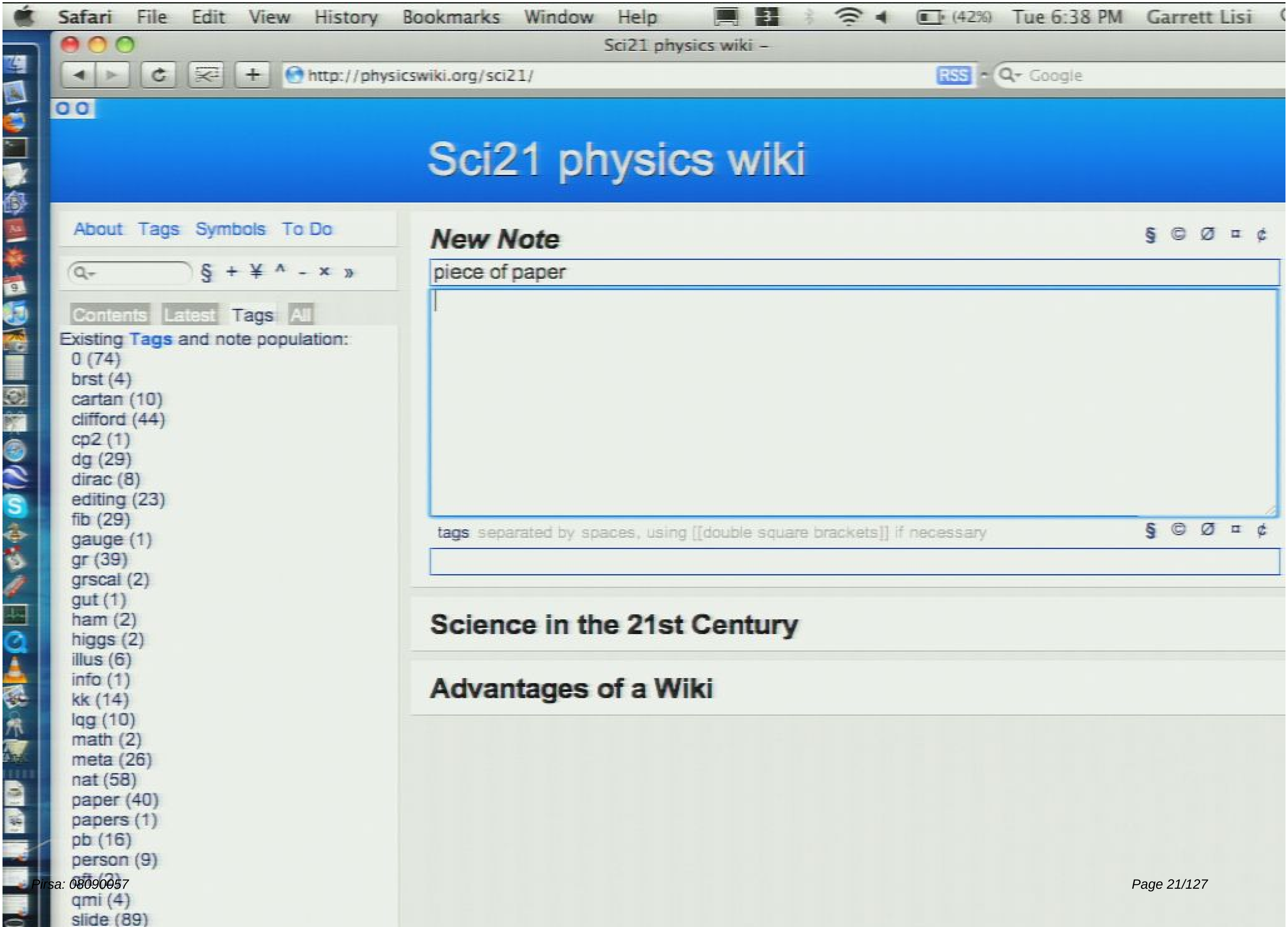
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\noindent

The building blocks of the standard model and gravity are fields over a four dimensional base manifold. The electroweak a
fields are described by Lie algebra valued connection 1-forms,
$$
\f{W} \in \f{su}(2) \quad \f{B} \in \f{u}(1) \quad \f{g} \in \f{su}(3)
$$
while the gravitational fields are described by the spin connection,
$$
\f{\om} \in \f{so}(3,1) = \f{Cl}{}^2(3,1)
$$
a Clifford bivector valued 1-form, and the frame, $\f{e} \in \f{Cl}{}^1(3,1)$, a Clifford vector valued 1-form. The frame may b
a multiplet of Higgs scalar fields, $\ph$, to interact with the electroweak gauge fields and fermions to give them masses. Th
represented as Grassmann valued spinor fields, $\{ \ud{\nu}{}_e, \ud{e}, \ud{u}, \dots \}$, with the spin connection and gau
on them in fundamental representations. The electroweak $\f{W}$ acts on doublets of left chiral fermions, $\{ [ \ud{\nu}{}_{
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electroweak $\f{B}$ acts on all with an interesting pattern of hypercharges. The left and right chiral parts of the gravitationa
connection, $\f{\om}$, act on the frame and on the left and right chiral fermions. This structure, depicted in Figure \ref{ptsm
over three generations of fermions with different masses.

This diverse collection of fields in various algebras and representations is, inarguably, a mess. It is difficult at first to believe
unified as aspects of a unique mathematical structure -- but they can. The gauge fields are known to combine naturally as
a grand unified theory with a larger Lie group, and we continue with unification in this spirit. The spin connection, frame, an
viewed as Lie algebra elements and included as parts of a "graviweak" connection. Relying on the algebraic structure of th
groups, the fermions may also be recast as Lie algebra elements and included naturally as parts of a BRST extended conn
\cite{Lisi,Holt} The result of this program is a single principal bundle connection with everything,
\begin{equation}
\begin{array}{rcl}
\udf{A} &=& \ha \f{\om} + \fr{1}{4} \f{e} \ph + \f{B} + \f{W} + \f{g} + \vp{}_{\big{}} \\
&& + \, \big( \ud{\nu}{}_e + \ud{e} + \ud{u} + \ud{d} \big)
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&& + \, \big( \ud{\nu}{}_e + \ud{e} + \ud{u} + \ud{d} \big)
+ \big( \ud{\nu}{}_\mu + \ud{\mu} + \ud{c} + \ud{s} \big)
+ \big( \ud{\nu}{}_\ta + \ud{\ta} + \ud{t} + \ud{b} \big)
\end{array}
\label{bigA}
\end{equation}
In this connection the bosonic fields, such as the strong $\f{g}=\f{dx^i} g_i^{\p{i}A} T_A$, are Lie algebra valued 1-forms, a
fields, such as $\ud{u} = \ud{u}{}^A T_A$, are Lie algebra valued Grassmann numbers.  (These Grassmann fields may be
ghosts of former gauge fields, or accepted a priori as parts of this superconnection.)

The dynamics are described by the curvature,
\begin{equation}
\label{bigF}
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+ \big( \ud{\nu}{}_\mu + \ud{\mu} + \ud{c} + \ud{s} \big)
+ \big( \ud{\nu}{}_\ta + \ud{\ta} + \ud{t} + \ud{b} \big)
\end{array}
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In this connection the bosonic fields, such as the strong $\f{g}=\f{dx^i} g_i^{\p{i}A} T_A$,
are Lie algebra valued 1-forms, and the fermionic fields, such as $\ud{u} = \ud{u}{}^A
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The building blocks of the standard model and gravity are fields over a four dimensional base manifold. The electroweak and strong gauge fields are described by Lie algebra valued connection 1-forms,

$$\underline{W} \in \underline{su}(2) \quad \underline{B} \in \underline{u}(1) \quad \underline{g} \in \underline{su}(3)$$

while the gravitational fields are described by the spin connection,

$$\underline{\omega} \in \underline{so}(3,1) = \underline{Cl}^2(3,1)$$

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This diverse collection of fields in various algebras and representations is,

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$$\begin{aligned} \underline{A} &= \tfrac{1}{2}\underline{\omega} + \tfrac{1}{4}\underline{e}\phi + \underline{B} + \underline{W} + \underline{g} + \\ &\quad + (\nu_e + e + u + d) + (\nu_\mu + \mu + c + s) + (\nu_\tau + \tau + t + b) \end{aligned} \qquad \text{(bigA)}$$

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$$\begin{aligned} A &= \tfrac{1}{2}\omega + \tfrac{1}{4}e\phi + B + W + g + \\ &\quad + (\nu_e + e + u + d) + (\nu_\mu + \mu + c + s) + (\nu_\tau + \tau + t + b) \end{aligned} \qquad \text{(bigA)}$$

In this connection the bosonic fields, such as the strong $g = dx^i g_i{}^A T_A$, are Lie algebra valued 1-forms, and the fermionic fields, such as $u = u^A T_A$, are Lie algebra valued Grassmann numbers. (These Grassmann fields may be considered ghosts of former gauge fields, or accepted a priori as parts of this **superconnection**.)

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superconnection

A **superconnection**,

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$$A = \underline{A} + \underset{\cdot}{A}$$

is the sum of a **Lie algebra** valued **connection 1-form** field, $\underline{A} = \underline{dx}^i A_i{}^B T_B$, and a Lie algebra valued **Grassmann number** field, $\underset{\cdot}{A} = \underset{\cdot}{A}^B T_B$. This construct arises naturally in the **BRST technique**, in which it is called a BRST extended connection.

Ref:

- Shlomo Sternberg
  - Toronto Lectures on Physics
- G. Catren and J. Devoto
  - Extended Connection in Yang-Mills Theory

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connection

A **connection** completely encodes the local geometry of a **fiber bundle**. Specifically, it describes how the local trivializations change as one moves around on the base manifold. The group of these changes is the same as the structure group, G, of the fiber bundle. From any point, the infinitesimal change of a local trivialization when moving in any direction is described by the operation of a **Lie algebra** element. These changes may be described via a **Lie algebra** valued **1-form** over the base, the connection,

fib

$$\underline{A} = \underline{dx}^i A_i{}^B(x) T_B$$

with the appropriate action on the fiber elements. Using this connection, the **covariant derivative** of a section, $\sigma(x)$, (valued in the fiber) is

$$\underline{\nabla}\sigma = \underline{d}\sigma + \underline{A}\sigma = \underline{dx}^i \left(\partial_i \sigma + A_i{}^B T_B \sigma \right)$$

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1-form

A **1-form**, or ***cotangent vector***, $\underline{f}$, is a geometric object that acts on a **tangent vector** at a point, p, to give a real number. It may be written in terms of the **coordinate basis 1-forms** as

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$$\underline{f} = f_i \underline{dx}^i \in T_p^* M$$

It is a linear operator, and so may be written as a function of a vector or more simply as a **vector-form contraction** (product),

$$\underline{f}(\vec{v}) = \mathbf{i}_{\vec{v}} \underline{f} = \vec{v}\, \underline{f} = v^j f_i \vec{\partial}_j \underline{dx}^i = v^j f_i \delta^i_j = v^i f_i \in \Re$$

The vector space of **1-forms** at each point, p, of a **manifold**, M, is the **cotangent space**, $T_p^* M$, and is spanned

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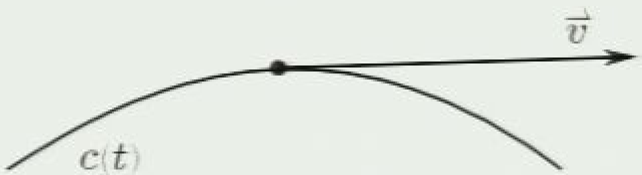
tangent vector



The ***velocity***, or **tangent vector**, $\vec{v}$, with respect to some parameter, t, of a **path**, $c(t)$, at a point is defined via the **directional derivative** of a **function**, $f(x)$, along the path,

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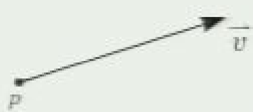
$$\left.\frac{df(c(t))}{dt}\right|_{t=0} = \left.\frac{dc^i(t)}{dt}\right|_{t=0} \left.\frac{\partial f}{\partial x^i}\right|_{c(0)} = v^i \left.\frac{\vec{\partial}}{\partial x^i}[f]\right|_{c(0)} = \vec{v}[f]$$

A tangent vector, or simply "***vector***", can also be visualized in the pseudo-Euclidean embedding space containing the manifold. For a manifold parameterized by coordinates, the **coordinate basis vectors** are

$$\vec{\partial}_i = \frac{\vec{\partial}}{\partial x^i} = \frac{\partial \vec{p}}{\partial x^i} = \partial_i \vec{p}$$

with the parameterized manifold points, $\vec{p}(x)$, vectors from some arbitrary origin in the flat embedding space.



A vector at a point, p, may be written in terms of coordinate basis vectors,

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The real valued quantities, v^i, are the velocity components. (Summation over repeated **indices** is implied.)

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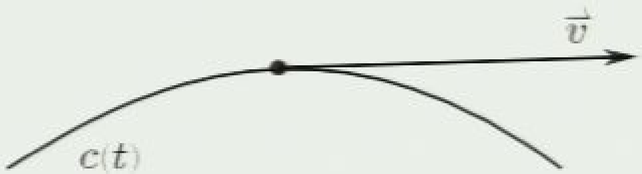
tangent vector



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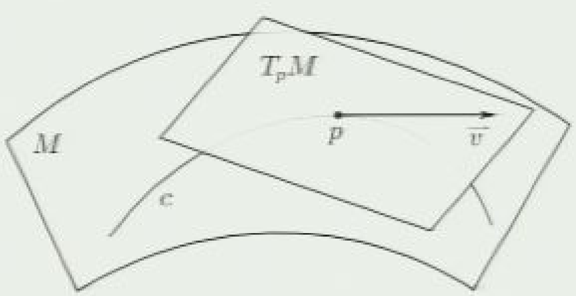

The space of all tangent vectors to a **manifold**, M, at a point, p, is a **vector space**, T_pM, the **tangent space** to M at p.

The directional derivative of a function may also be be written using the **exterior derivative** and **vector-form algebra** as

$$\vec{v}[f] = \vec{v}\underline{d}f = v^i \partial_i f$$

1-form, Hodge identities, Killing spinor, Lie derivative, Lorentz rotation, Symbols, commutator, coordinate basis vectors, coordinate change, differential form, exterior derivative, flow, frame, geodesic, natural, path, proper time, pullback, rest frame, submanifold geometry, tangent bundle, tangent bundle parallel transport, vector bundle parallel transport, vector projection onto a section, vector valued form, vector-form algebra

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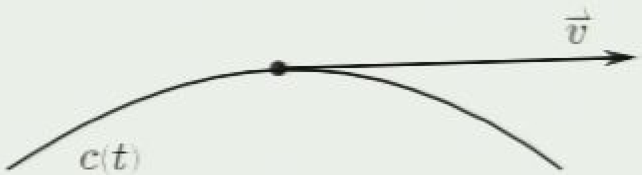
tangent vector



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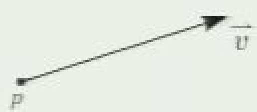
The ***velocity***, or **tangent vector**, $\vec{v}$, with respect to some parameter, t, of a path, $c(t)$, at a point is defined via the **directional derivative** of a function, $f(x)$, along the path,

$$\left.\frac{df(c(t))}{dt}\right|_{t=0} = \left.\frac{dc^i(t)}{dt}\right|_{t=0} \left.\frac{\partial f}{\partial x^i}\right|_{c(0)} = v^i \left.\frac{\vec{\partial}}{\partial x^i}[f]\right|_{c(0)} = \vec{v}[f]$$

A tangent vector, or simply "***vector***", can also be visualized in the pseudo-Euclidean embedding space containing the manifold. For a manifold parameterized by coordinates, the coordinate basis vectors are

$$\vec{\partial}_i = \frac{\vec{\partial}}{\partial x^i} = \frac{\partial \vec{p}}{\partial x^i} = \partial_i \vec{p}$$

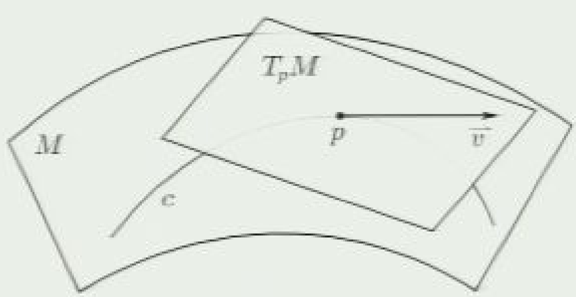
with the parameterized manifold points, $\vec{p}(x)$, vectors from some arbitrary origin in the flat embedding space.



A vector at a point, p, may be written in terms of coordinate basis vectors,

$$\vec{v} = \frac{dc^i(t)}{dt}\vec{\partial}_i = v^i \vec{\partial}_i$$

The real valued quantities, v^i, are the velocity components. (Summation over repeated indices is implied)



The space of all tangent vectors to a manifold, M, at a point, p, is a vector space, T_pM, the **tangent space** to M at p.

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A **superconnection**,

$$\underline{\mathcal{A}} = \underline{A} + \underset{\cdot}{A}$$

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is the sum of a **Lie algebra** valued **connection 1-form** field, $\underline{A} = \underline{dx}^i A_i{}^B T_B$, and a Lie algebra valued **Grassmann number** field, $\underset{\cdot}{A} = \underset{\cdot}{A}^B T_B$. This construct arises naturally in the **BRST technique**, in which it is called a BRST extended connection.

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(more at **BRST speculation**)

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Chern-Simons form

A **Chern-Simons form**, ω_p, is a grade p **differential form** defined (for odd p) to satisfy

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$$d\omega_p = Tr\left(F^{\frac{p+1}{2}} \right)$$

in which $F = dA + AA$ is the **curvature** for some **principal bundle connection**, A. The first few Chern-Simons forms are

$$\omega_1 = Tr\left(A \right)$$

$$\omega_3 = Tr\left(FA - \frac{1}{3} AAA \right)$$

$$\omega_5 = Tr\left(FFA - \frac{1}{2} FAAA + \frac{1}{10} AAAAA \right)$$

$$\omega_7 = Tr\left(FFFA + ?FFAAA + ?FAAAAA + ?AAAAAAA \right)$$

The **integral** of a Chern-Simons p-form over a p dimensional **manifold** is a homotopy invariant called the **Chern number**,

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curvature

fib

The curvature is perhaps the most important object characterizing the local geometry of a **fiber bundle** and **connection.** Its expression and action depends on the action of the structure group. Taking, for example, the structure group to act from the left, the **curvature** is then a local, **Lie algebra** (of the structure group) valued **2-form** defined as

$$\begin{aligned} F(x) &= \frac{1}{2} dx^i dx^j F_{ij}{}^B T_B \\ &= dA + AA \\ &= dA + A \times A \\ &= dA + \frac{1}{2}\left[A, A\right] \end{aligned}$$

The curvature coefficients are

$$F_{ij}{}^C = \partial_i A_j{}^C - \partial_j A_i{}^C + A_i{}^A A_j{}^B C_{AB}{}^C$$

in which $C_{AB}{}^C$ are the **structure constants.**

The curvature is most intuitively derived in terms of the **holonomy** of infinitesimal loops.

It may also be derived by applying the **covariant derivative** twice to any fiber bundle section,

$$\nabla\nabla C = \left(d + A\right)\left(d + A\right) C = ddC + dAC + AdC + AAC = \left(dA + AA\right) C = FC$$

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$$\underline{\nabla}\underline{\nabla}C = \left(\underline{d}+\underline{A}\right)\left(\underline{d}+\underline{A}\right)C = \underline{d}\underline{d}C + \underline{d}\underline{A}C + \underline{A}\underline{d}C + \underline{A}\underline{A}C = \left(\underline{d}\underline{A}+\underline{A}\underline{A}\right)C = \underline{F}C$$

The curvature changes under **gauge transformations**, $C \mapsto C' = gC$, as $\underline{F} \mapsto \underline{F}' = g\underline{F}g^-$.

Note again that the expression of the curvature, and its action, depends on the form of the group action.

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curvature

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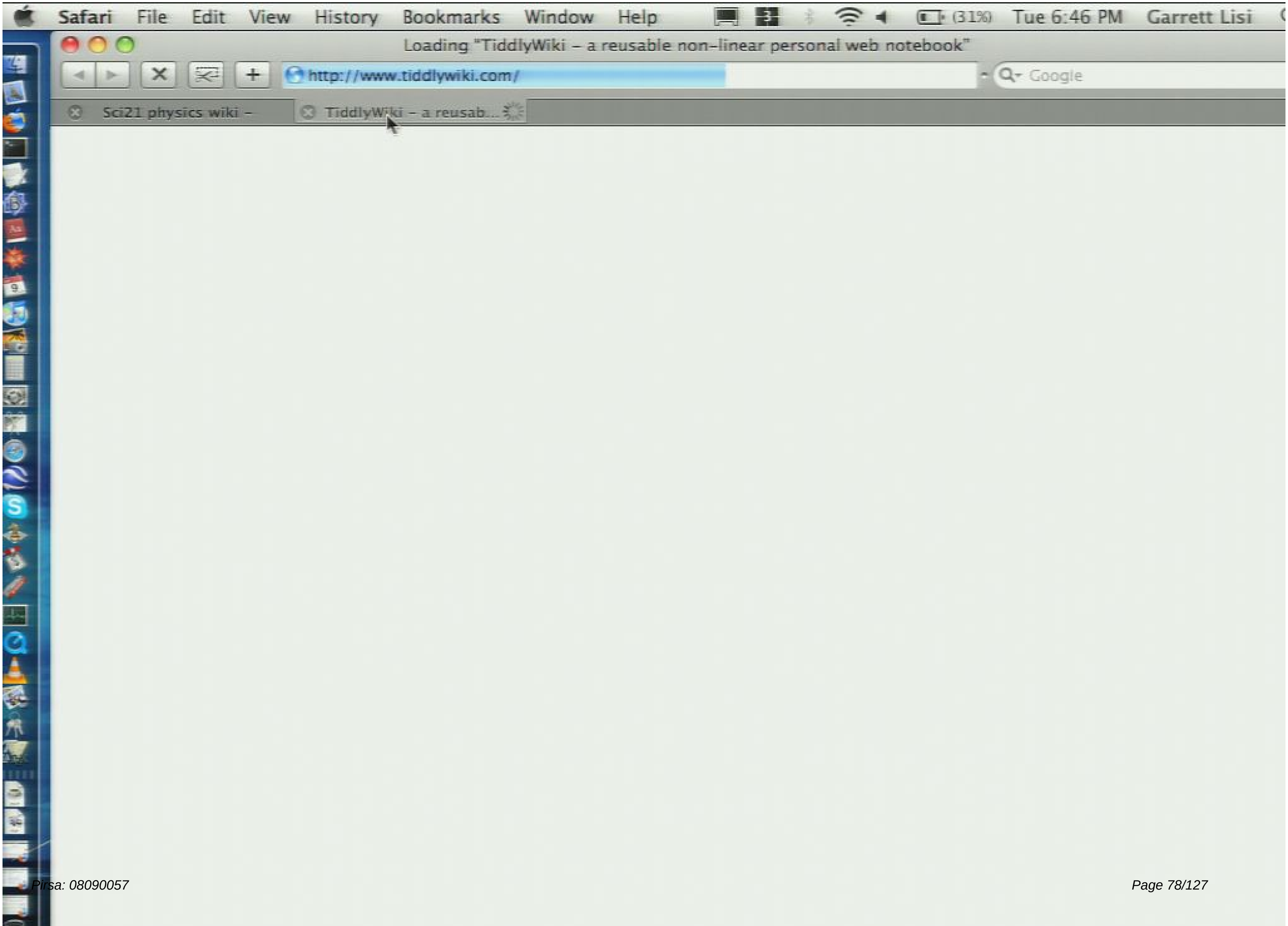
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HelloThere

Welcome to TiddlyWiki!

tags: welcome gettingstarted

TiddlyWiki is a single html file which has all the characteristics of a **wiki** - including all of the content, the functionality (including editing, saving, tagging and searching) and the style sheet. Because it's a single file, it's very portable - you can email it, put it on a web server or share it via a **USB stick**.

But it's not just a wiki! It has very powerful plugin capabilities, so it can also be used to build new tools. You have full control over how it looks and behaves. For example, TiddlyWiki is already being used as:

- A personal notebook
- A GTD ("Getting Things Done") productivity tool
- A collaboration tool
- For building websites (this site is a TiddlyWiki file!)
- For rapid prototyping
- ...and much more!

You can import and export data to and from all sorts of places. Check out some of the **Examples** of TiddlyWiki in use, and the **Features** that are available.

You can see the web functionality of TiddlyWiki by clicking on some of the links on this website. Double click some of the text to see 'edit mode'. For the full range of functions, including editing and saving changes, download and install a copy of the basic version and then follow the guidelines in **Getting Started**. Have fun!

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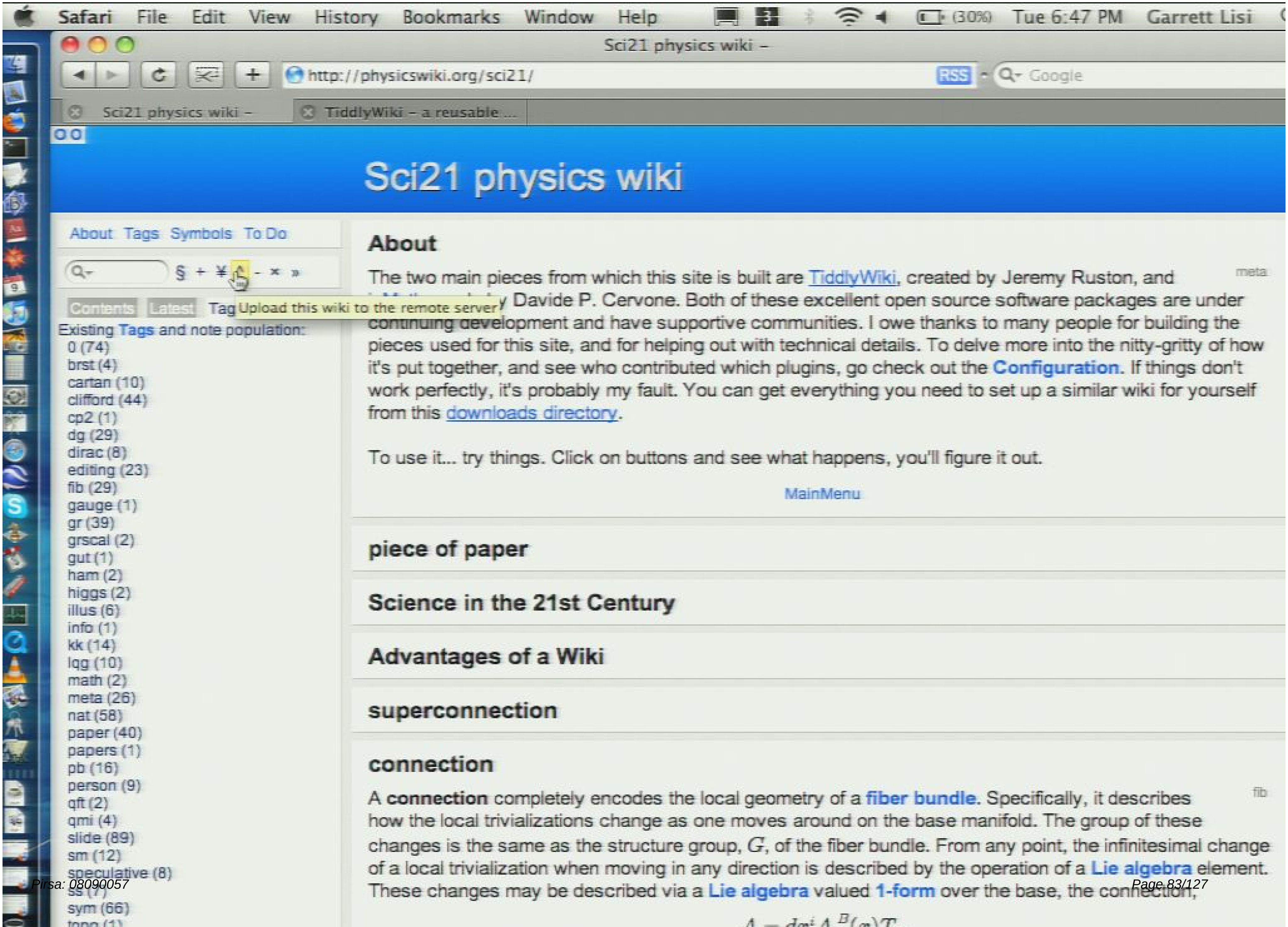
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with the appropriate action on the fiber elements. Using this connection, the **covariant derivative** of a section, $\sigma(x)$, (valued in the fiber) is

$$\underline{\nabla}\sigma = \underline{d}\sigma + \underline{A}\sigma = \underline{dx}^i \left(\partial_i \sigma + A_i{}^B T_B \sigma \right)$$

in which the Lie algebra basis elements, T_B, act on the fiber. The connection changes under a **gauge transformation** so as to keep this derivative covariant.

fib

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curvature

fib

The curvature is perhaps the most important object characterizing the local geometry of a **fiber bundle** and **connection**. Its expression and action depends on the action of the structure group. Taking, for example, the structure group to act from the left, the **curvature** is then a local, **Lie algebra** (of the structure group) valued **2-form** defined as

$$\underline{\underline{F}}(x) = \frac{1}{2}\underline{dx}^i \underline{dx}^j F_{ij}{}^B T_B$$

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$$\begin{aligned} \underline{F}(x) &= \tfrac{1}{2} \underline{dx}^i \underline{dx}^j F_{ij}{}^B T_B \\ &= \underline{d}\underline{A} + \underline{A}\underline{A} \\ &= \underline{d}\underline{A} + \underline{A} \times \underline{A} \\ &= \underline{d}\underline{A} + \tfrac{1}{2}\left[\underline{A}, \underline{A}\right] \end{aligned}$$

The curvature coefficients are

$$F_{ij}{}^C = \partial_i A_j{}^C - \partial_j A_i{}^C + A_i{}^A A_j{}^B C_{AB}{}^C$$

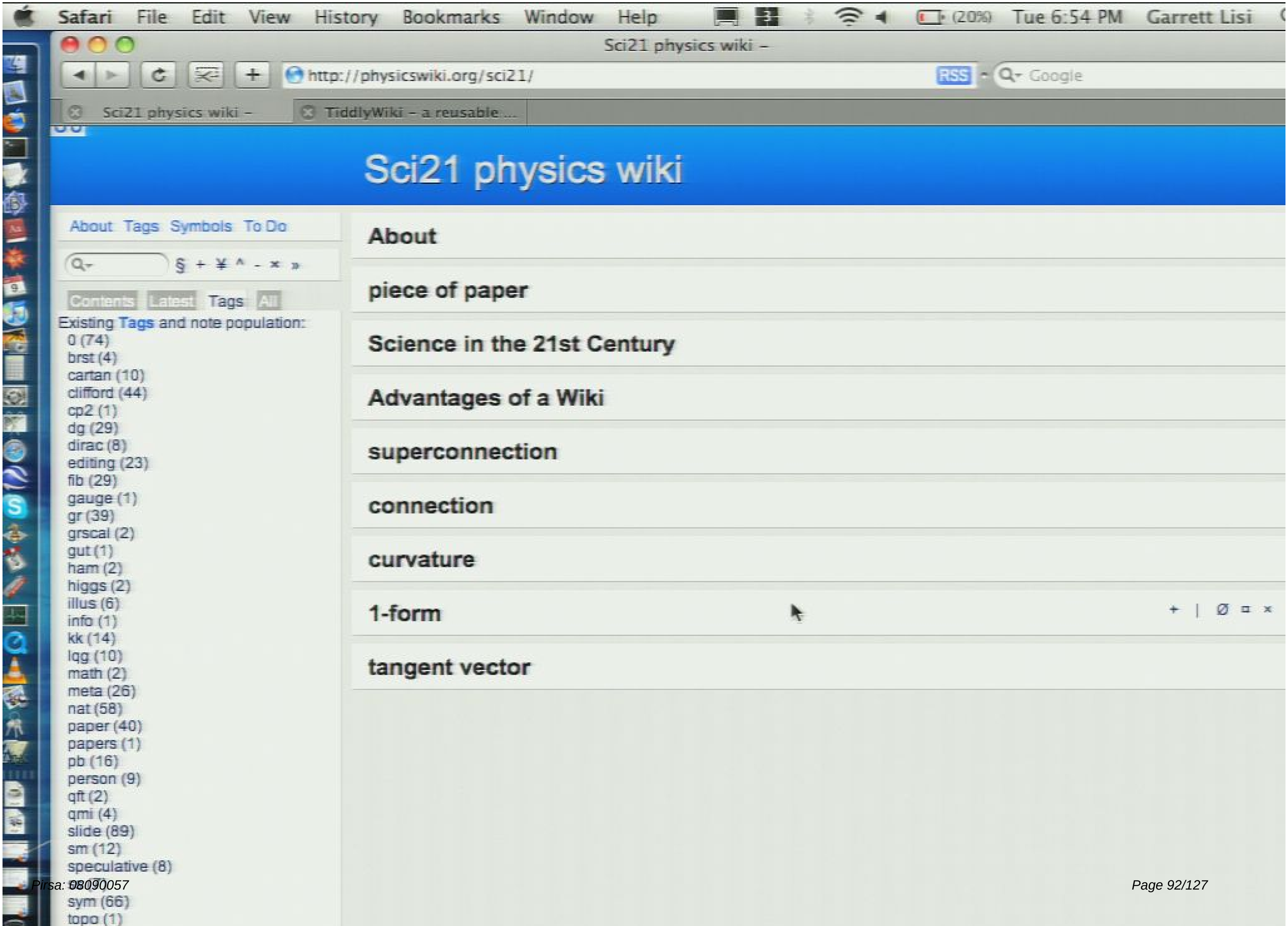
in which $C_{AB}{}^C$ are the **structure constants**.

The curvature is most intuitively derived in terms of the **holonomy** of infinitesimal loops.

It may also be derived by applying the **covariant derivative** twice to any fiber bundle section,

$$\nabla\nabla C = \left(\underline{d} + \underline{A}\right)\left(\underline{d} + \underline{A}\right) C = \underline{d}\underline{d}C + \underline{d}\underline{A}C + \underline{A}\underline{d}C + \underline{A}\underline{A}C = \left(\underline{d}\underline{A} + \underline{A}\underline{A}\right) C = \underline{F}C$$

The curvature changes under **gauge transformations**, $C \mapsto C' = gC$, as $\underline{F} \mapsto \underline{F}' = g\underline{F}g^{-}$.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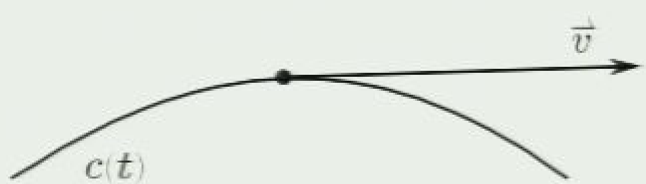

nat illus

The ***velocity***, or **tangent vector**, $\vec{v}$, with respect to some parameter, t, of a path, $c(t)$, at a point is defined via the **directional derivative** of a function, $f(x)$, along the path,

$$\left.\frac{df(c(t))}{dt}\right|_{t=0} = \left.\frac{dc^i(t)}{dt}\right|_{t=0} \left.\frac{\partial f}{\partial x^i}\right|_{c(0)} = v^i \frac{\vec{\partial}}{\partial x^i}[f]\Big|_{c(0)} =$$

A tangent vector, or simply "***vector***", can also be visualized in the pseudo-Euclidean embedding space containing the manifold. For a manifold parameterized by coordinates, the **coordinate basis vectors** are

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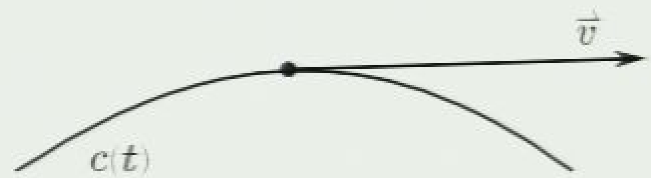

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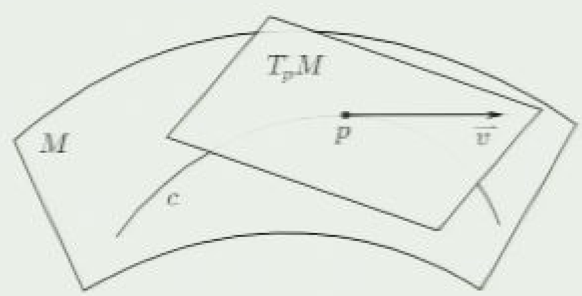
$$\vec{\partial}_i = \frac{\vec{\partial}}{\partial x^i} = \frac{\partial \vec{p}}{\partial x^i} = \partial_i \vec{p}$$

with the parameterized manifold points, $\vec{p}(x)$, vectors from some arbitrary origin in the flat embedding space.

A vector at a point, p, may be written in terms of coordinate basis vectors,

$$\vec{v} = \frac{dc^i(t)}{dt}\vec{\partial}_i = v^i \vec{\partial}_i$$

The real valued quantities, v^i, are the velocity components. (Summation over repeated indices is implied)



The space of all tangent vectors to a manifold, M, at a point, p, is a vector space, T_pM, the **tangent space** to M at p.

The directional derivative of a function may also be be written using the exterior derivative and vector-form algebra as

$$\vec{v}[f] = \vec{v}\, df = v^i \partial_i f$$

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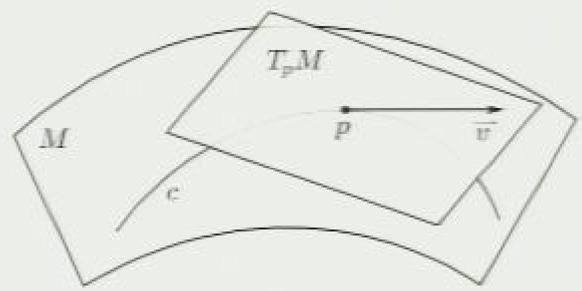

The space of all tangent vectors to a **manifold**, M, at a point, p, is a **vector space**, T_pM, the **tangent space** to M at p.

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1-form, Hodge identities, Killing spinor, Lie derivative, Lorentz rotation, Symbols, commutator, coordinate basis vectors, coordinate change, differential form, exterior derivative, flow, frame, geodesic, natural, path, proper time, pullback, rest frame, submanifold geometry, tangent bundle, tangent bundle parallel transport, vector bundle parallel transport, vector projection onto a section, vector valued form, vector-form algebra

manifold

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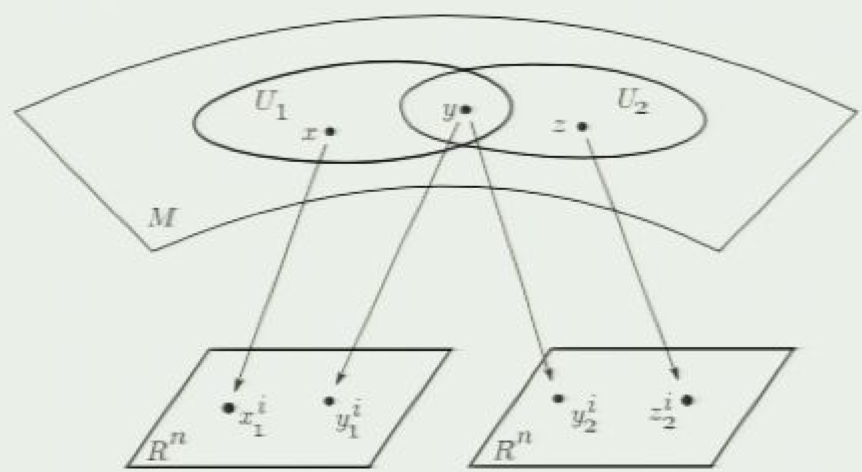

An oriented n dimensional differentiable **manifold**, M, may be visualized as a curved n dimensional surface embedded in a higher dimensional, pseudo-Euclidean space. A manifold is described mathematically by a collection of coordinate charts (patches), $\{(U_a, x_a)\}$, with the open sets, U_a, labeled by a, covering M, and the coordinates, $x_a : U_a \to \mathbb{R}^n$, homeomorphic maps into open subsets of $\mathbb{R}^n$

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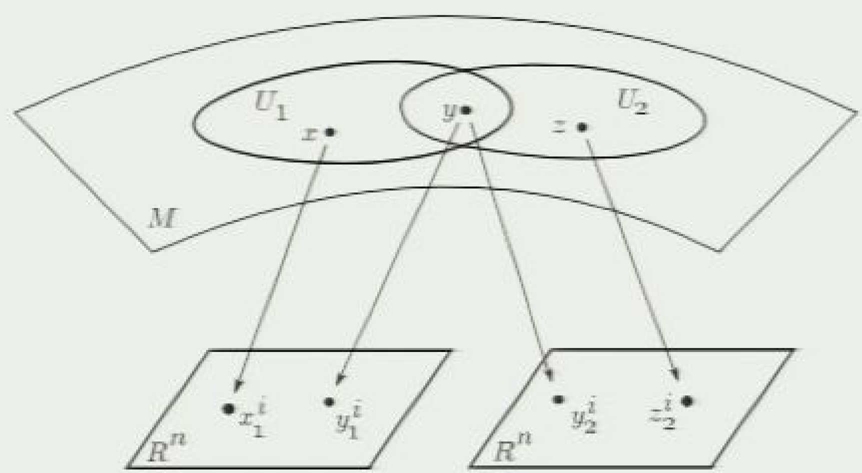

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For more on manifolds, see http://en.wikipedia.org/wiki/Manifold

1-form, 2-sphere, 3-sphere, An Exceptionally Simple Theory of Everything, Chern-Simons form, Clifford bundle, Clifford vector bundle, Curvature of bosonic part, Discussion, Killing vector, Lie group, Lie group geometry, Symbols, This Week's Finds 253, almost complex structure, closed, cohomology, coordinate basis vectors, coordinate change, cotangent bundle, diffeomorphism, differential form, distribution, exact, fiber bundle, function, geodesic, homogeneous space, indices, natural, partial derivative, path, pullback, rest frame, spacetime, submanifold, submanifold geometry, tangent bundle, tangent vector, the big picture, vector space, vector valued form

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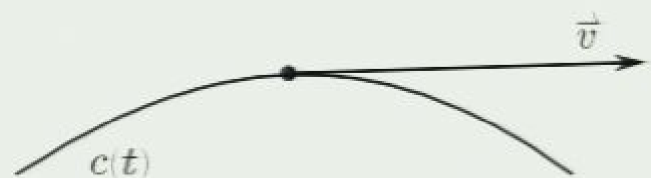

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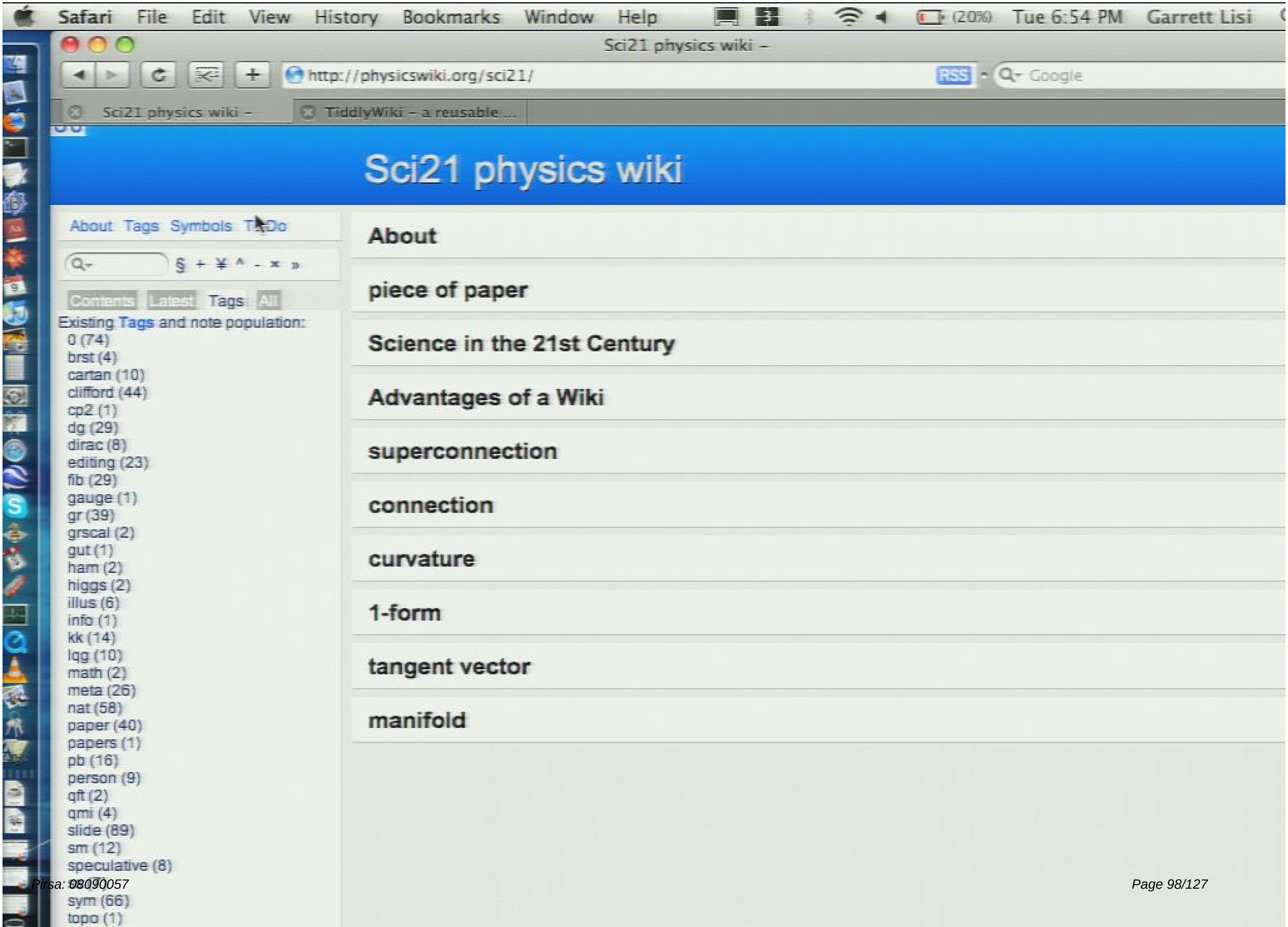
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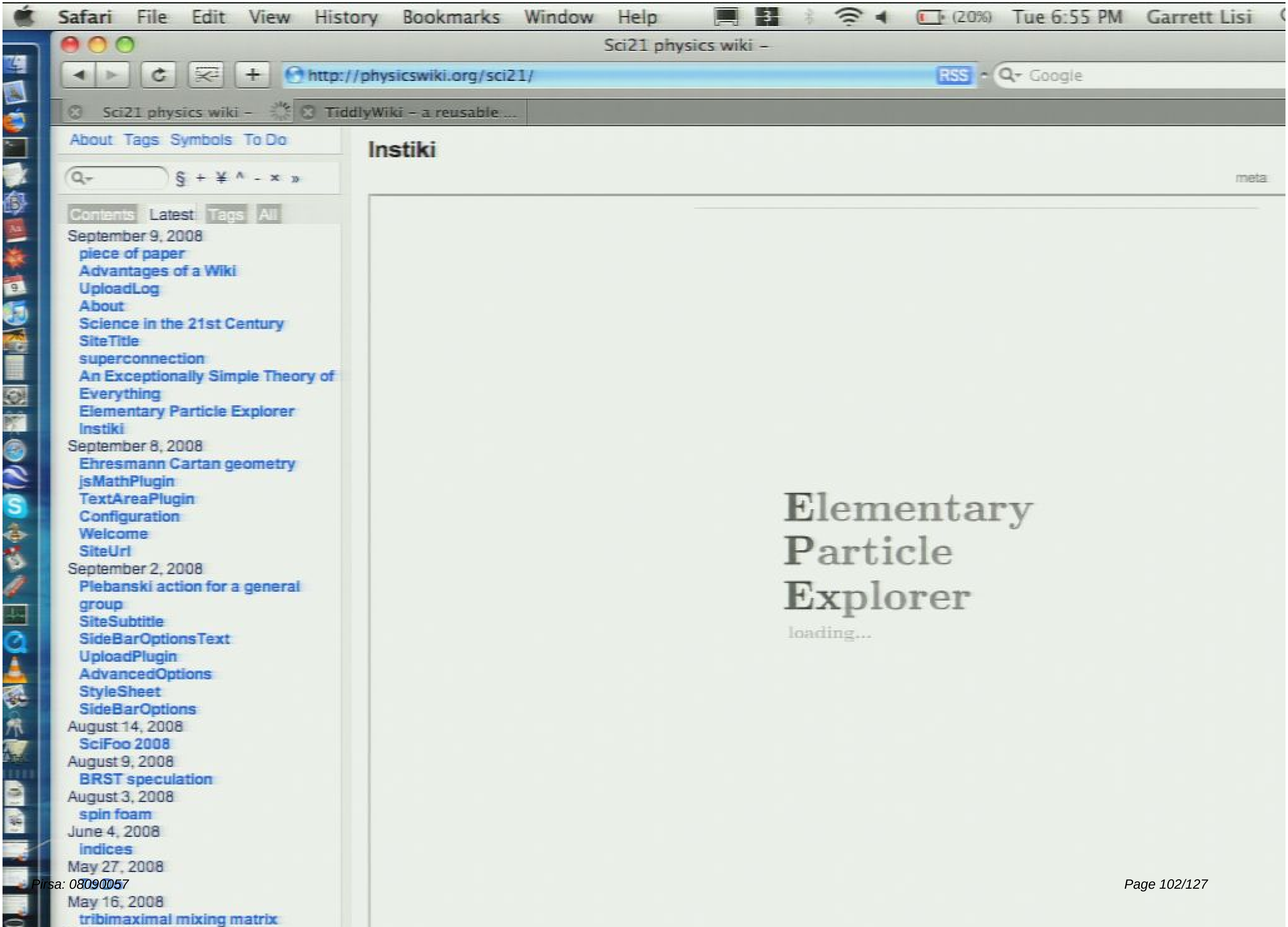
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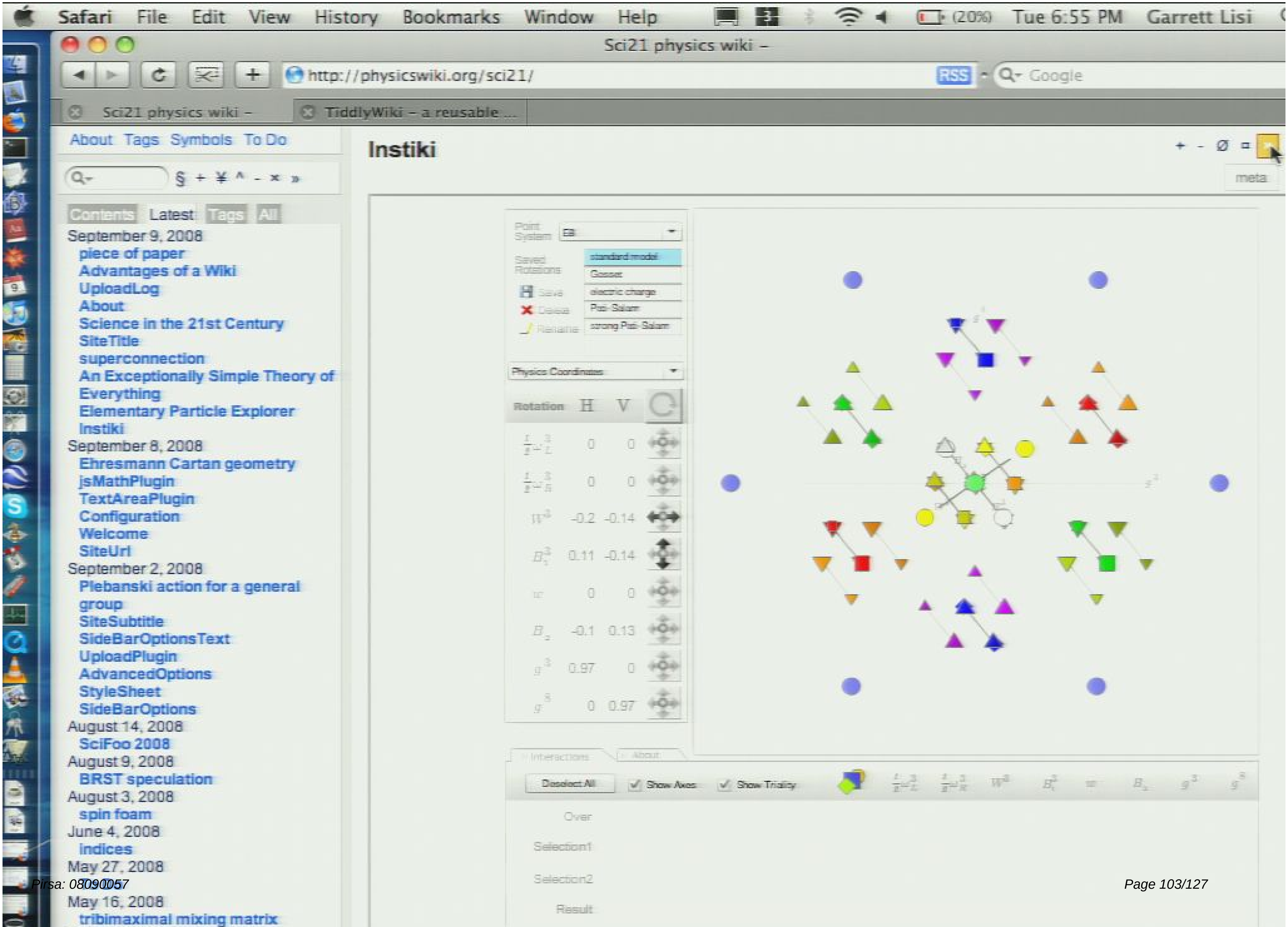
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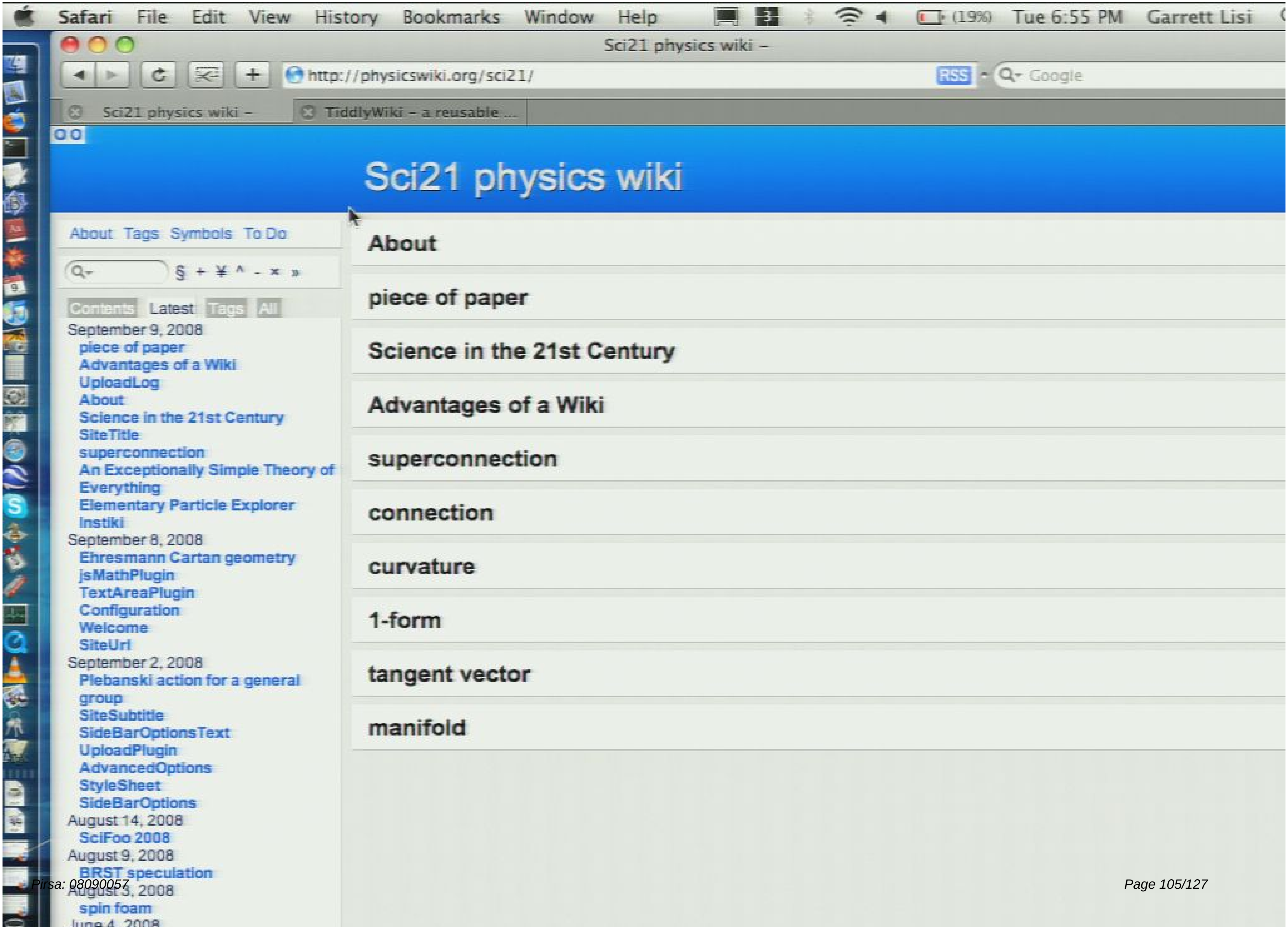
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Created by	BobMcElrath (edited by Garrett)
Email	my first name at my last name dot org
Location	http://bob.mcelrath.org/tiddlyjsmath-2.0.3.html
Version	1.3.g
Requires	TiddlyWiki ≥ 2.1, jsMath ≥ 3.0

Description

LaTeX is the world standard for specifying, typesetting, and communicating mathematics among scientists, engineers, and mathematicians. For more information about LaTeX itself, visit the LaTeX Project. This plugin typesets math using jsMath, which is an implementation of the TeX math rules and typesetting in javascript, for your browser. Notice the small button in the lower right corner which opens its control panel.

Installation

In addition to this plugin, you must also install jsMath on the same server as your TiddlyWiki html file. If you're using TiddlyWiki without a web server, then the jsMath directory must be placed in the same location as the TiddlyWiki html file.

Examples

Source	Output
`The variable $x$ is real.`	The variable x is real.
`The variable \(y\) is complex.`	The variable y is complex.
`This \[\int_a^b x = \frac{1}{2}(b^2-a^2)\] is an easy integral.`	This $$\int_a^b x = \frac{1}{2}(b^2-a^2)$$ is an easy integral.
[illegible]	This

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|Name|Plugin: jsMath|
|Created by|BobMcElrath (edited by Garrett)|
|Email|my first name at my last name dot org|
|Location|http://bob.mcelrath.org/tiddlyjsmath-2.0.3.html|
|Version|1.3.g|
|Requires|[[TiddlyWiki|http://www.tiddlywiki.com]] &ge; 2.1, [[jsMath|http://www.math.union.edu/~dpvc/jsMath/]] &ge; 3.0|
!Description
[[LaTeX]] is the world standard for specifying, typesetting, and communicating mathematics among scientists, engineers, and mathematicians. For more information about LaTeX itself, visit the [[LaTeX Project|http://www.latex-project.org/]]. This plugin typesets math using [[jsMath|http://www.math.union.edu/~dpvc/jsMath/]], which is an implementation of the TeX math rules and typesetting in javascript, for your browser. Notice the small button in the lower right corner which opens its control panel.
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!Examples
|!Source|!Output|h
|{{{The variable $x$ is real.}}}|The variable $x$ is real.|
|{{{The variable \(y\) is complex.}}}|The variable \(y\) is complex.|
|{{{This \[\int_a^b x = \frac{1}{2}(b^2-a^2)\] is an easy integral.}}}|This \[\int_a^b x = \frac{1}{2}(b^2-a^2)\] is an easy integral.|
|{{{This $$\int_a^b \sin x = -(\cos b - \cos a)$$ is another easy integral.}}}|This $$\int_a^b \sin x = -(\cos b - \cos a)$$ is another easy integral.|
|{{{Block formatted equations may also use the 'equation' environment \begin{equation} \int \tan x = -\ln \cos x \end{equation} }}}|Block formatted equations may also use the 'equation' environment \begin{equation} \int \tan x = -\ln \cos x \end{equation}|
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|Location|http://bob.mcelrath.org/tiddlyjsmath-2.0.3.html|
|Version|1.3.g|
|Requires|[[TiddlyWiki|http://www.tiddlywiki.com]] &ge; 2.1, [[jsMath|http://www.math.union.edu/~dpvc/jsMath/]] &ge; 3.0|
!Description
[[LaTeX]] is the world standard for specifying, typesetting, and communicating mathematics among scientists, engineers, and mathematicians. For more information about LaTeX itself, visit the [[LaTeX Project|http://www.latex-project.org/]]. This plugin typesets math using [[jsMath|http://www.math.union.edu/~dpvc/jsMath/]], which is an implementation of the TeX math rules and typesetting in javascript, for your browser. Notice the small button in the lower right corner which opens its control panel.
!Installation
In addition to this plugin, you must also [[install jsMath|http://www.math.union.edu/~dpvc/jsMath/download/jsMath.html]] on the same server as your TiddlyWiki html file. If you're using TiddlyWiki without a web server, then the jsMath directory must be placed in the same location as the TiddlyWiki html file.
!Examples
|!Source|!Output|h
|{{{The variable $x$ is real.}}}|The variable $x$ is real.|
|{{{The variable \(y\) is complex.}}}|The variable \(y\) is complex.|
|{{{This \[\int_a^b x = \frac{1}{2}(b^2-a^2)\] is an easy integral.}}}|This \[\int_a^b x = \frac{1}{2}(b^2-a^2)\] is an easy integral.|
|{{{This $$\int_a^b \sin x = -(\cos b - \cos a)$$ is another easy integral.}}}|This $$\int_a^b \sin x = -(\cos b - \cos a)$$ is another easy integral.|
|{{{Block formatted equations may also use the 'equation' environment \begin{equation} \int \tan x = -\ln \cos x \end{equation} }}}|Block formatted equations may also use the 'equation' environment \begin{equation} \int \tan x = -\ln \cos x \end{equation}|
```

tags separated by spaces, using [[double square brackets]] if necessary

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jsMathPlugin

jsMathPlugin

```
jsMath.Macro('et','\\eta');
jsMath.Macro('th','\\theta');
jsMath.Macro('io','\\iota');
jsMath.Macro('ka','\\kappa');
jsMath.Macro('la','\\lambda');
jsMath.Macro('rh','\\rho');
jsMath.Macro('si','\\sigma');
jsMath.Macro('ta','\\tau');
jsMath.Macro('up','\\upsilon');
jsMath.Macro('ph','\\phi');
jsMath.Macro('ch','\\chi');
jsMath.Macro('ps','\\psi');
jsMath.Macro('om','\\omega');
jsMath.Macro('Ga','\\Gamma');
jsMath.Macro('De','\\Delta');
jsMath.Macro('Th','\\Theta');
jsMath.Macro('La','\\Lambda');
jsMath.Macro('Si','\\Sigma');
jsMath.Macro('Up','\\Upsilon');
jsMath.Macro('Ph','\\Phi');
jsMath.Macro('Ps','\\Psi');
jsMath.Macro('Om','\\Omega');

/* misc */
jsMath.Macro('pa','\\partial');
jsMath.Macro('na','\\nabla');
jsMath.Macro('ti','\\times');
jsMath.Macro('lb','\\left[');
jsMath.Macro('rb','\\right]');
jsMath.Macro('lp','\\left(');
```

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jsMathPlugin

```
jsMath.Macro('th','\\theta');
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jsMath.Macro('la','\\lambda');
jsMath.Macro('rh','\\rho');
jsMath.Macro('si','\\sigma');
jsMath.Macro('ta','\\tau');
jsMath.Macro('up','\\upsilon');
jsMath.Macro('ph','\\phi');
jsMath.Macro('ch','\\chi');
jsMath.Macro('ps','\\psi');
jsMath.Macro('om','\\omega');
jsMath.Macro('Ga','\\Gamma');
jsMath.Macro('De','\\Delta');
jsMath.Macro('Th','\\Theta');
jsMath.Macro('La','\\Lambda');
jsMath.Macro('Si','\\Sigma');
jsMath.Macro('Up','\\Upsilon');
jsMath.Macro('Ph','\\Phi');
jsMath.Macro('Ps','\\Psi');
jsMath.Macro('Om','\\Omega');

/* misc */
jsMath.Macro('pa','\\partial');
jsMath.Macro('na','\\nabla');
jsMath.Macro('ti','\\times');
jsMath.Macro('lb','\\left[');
jsMath.Macro('rb','\\right]');
jsMath.Macro('lp','\\left(');
```

tags separated by spaces, using [[double square brackets]] if necessary

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jsMathPlugin

jsMathPlugin

```
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jsMath.Macro('ri','\\right>');
jsMath.Macro('ll','\\left|');
jsMath.Macro('rl','\\right|');
jsMath.Macro('lc','\\left\\{');
jsMath.Macro('rc','\\right\\}');
jsMath.Macro('ld','\\left.');
jsMath.Macro('rd','\\right.');
jsMath.Macro('ha','{\\small \\frac{1}{2}}');
jsMath.Macro('fr','{\\small \\frac{#1}{#2}}',2);
jsMath.Macro('p','\\phantom{#1}',1);
jsMath.Macro('vp','\\vphantom{#1}',1);
jsMath.Macro('label','{\\;\\;\\;(\\mathrm{#1})}',1);

/* accents */
jsMath.Macro('f','{\\underset{\\raise4mu{\\smash{-}}}{{#1}}}',1);
jsMath.Macro('ff','{\\underset{\\raise3mu{\\smash{=}}}{{#1}}}',1);
jsMath.Macro('fff','{\\underset{\\raise3mu{\\smash{\\equiv}}}{{#1}}}',1);
jsMath.Macro('nf','{\\underset{\\raise4mu{\\smash{\\sim}}}{{#1}}}',1);
jsMath.Macro('ud','{\\underset{\\raise4mu{\\smash{\\cdot}}}{{#1}}}',1);
jsMath.Macro('od','{\\overset{\\lower4mu{.}}{{#1}}}',1);
jsMath.Macro('udf','{\\underset{\\raise4mu{\\smash{- \\cdot}}}{{#1}}}',1);
jsMath.Macro('udff','{\\underset{\\raise3mu{\\smash{= \\cdot}}}{{#1}}}',1);
jsMath.Macro('ve','{\\overset{\\lower4mu{\\moveright1mu{\\rightharpoonup}}}{{#1}}}',1);
jsMath.Macro('vv','{\\overset{\\lower4mu{\\overset{\\moveleft.1mu{\\lower4mu{\\Large
\\rightharpoonup}}}{\\rightharpoonup}}}{{#1}}}',1);

/* particle shapes */

jsMath.Macro('scir','\\lower.1em{\\rlap{\\color{#1}{\\Large \\bullet}}{\\Large \\circ}}',1);
```

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jsMathPlugin

systemConfig editing plugin

Name	Plugin: jsMath
Created by	BobMcElrath (edited by Garrett)
Email	my first name at my last name dot org
Location	http://bob.mcelrath.org/tiddlyjsmath-2.0.3.html
Version	1.3.g
Requires	TiddlyWiki ≥ 2.1, jsMath ≥ 3.0

Description

LaTeX is the world standard for specifying, typesetting, and communicating mathematics among scientists, engineers, and mathematicians. For more information about LaTeX itself, visit the LaTeX Project. This plugin typesets math using jsMath, which is an implementation of the TeX math rules and typesetting in javascript, for your browser. Notice the small button in the lower right corner which opens its control panel.

Installation

In addition to this plugin, you must also install jsMath on the same server as your TiddlyWiki html file. If you're using TiddlyWiki without a web server, then the jsMath directory must be placed in the same location as the TiddlyWiki html file.

Examples

Source	Output
`The variable $x$ is real.`	The variable x is real.
`The variable \(y\) is complex.`	The variable y is complex.
`This \[\int_a^b x = \frac{1}{2}(b^2-a^2)\] is an easy integral.`	This $$\int_a^b x = \frac{1}{2}(b^2-a^2)$$

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jsMathPlugin

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Name	Plugin: jsMath
Created by	BobMcElrath (edited by Garrett)
Email	my first name at my last name dot org
Location	http://bob.mcelrath.org/tiddlyjsmath-2.0.3.html
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`This \[\int_a^b x = \frac{1}{2}(b^2-a^2)\] is an easy integral.`	This $$\int_a^b x = \frac{1}{2}(b^2-a^2)$$

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Symbols

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Symbol	LaTeX	Use
$\mathbb{R}$ $\mathbb{C}$ n $\underset{\cdot}{a}$	\mathbb{R} \mathbb{C} n \ud{a}	real numbers, complex numbers, dimension, Grassmann number
M T_pM T_p^*M	M T_p M T_p^* M	manifold, tangent space to M at point p, cotangent space to M at point p
x^i $\vec{\partial}_i$ $\vec{v}$ $\vec{\vec{l}}$	x^i \ve{\pa_i} \ve{v} \vv{l}	coordinates and coordinate basis vectors with coordinate indices, tangent vector, loop
t τ	t \ta	parameter time, proper time
$\underset{\sim}{dx^i}$ $\underset{\sim}{a}$ $\underset{\approx}{b}$ $\underset{\approx}{c}$ f	\f{dx^i} \f{a} \ff{b} \fff{c} \nf{f}	coordinate basis 1-forms, 1-form, 2-form, 3-form, differential form of high or unspecified form grade
∂_i $\underset{\sim}{\partial}$ $\underset{\sim}{d}$	\pa_i \f{\pa} \f{d}	partial derivative, partial derivative, exterior derivative
ϕ ϕ^* ϕ_*	\ph \ph^* \ph_*	diffeomorphism, pullback, pushforward
$\mathcal{L}_{\vec{v}}$ $[\vec{v},\vec{u}]_L$ $\vec{\Delta}$	{\cal L}_{\ve{v}} \lb\ve{v},\ve{u}\rb_L \ve{\De}	Lie derivative, Lie bracket of two vector fields, distribution
	\f{\ve{A}} {\cal L}_{	vector valued form, FuN

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June 4, 2008

Symbols

math meta editing

Symbol	LaTeX	Use
$\mathbb{R}\ \mathbb{C}\ n\ \underset{\cdot}{a}$	`\mathbb{R} \mathbb{C} n \ud{a}`	real numbers, complex numbers, dimension, Grassmann number
$M\ T_pM\ T_p^*M$	`M T_p M T_p^* M`	manifold, tangent space to M at point p, cotangent space to M at point p
$x^i\ \vec{\partial}_i\ \vec{v}\ \vec{\vec{l}}$	`x^i \ve{\pa_i} \ve{v} \vv{l}`	coordinates and coordinate basis vectors with coordinate indices, tangent vector, loop
$t\ \tau$	`t \ta`	parameter time, proper time
$\underset{-}{dx^i}\ \underset{-}{a}\ \underset{=}{b}\ \underset{\equiv}{c}\ \underset{\sim}{f}$	`\f{dx^i} \f{a} \ff{b} \fff{c} \nf{f}`	coordinate basis 1-forms, 1-form, 2-form, 3-form, differential form of high or unspecified form grade
$\partial_i\ \underset{-}{\partial}\ \underset{-}{d}$	`\pa_i \f{\pa} \f{d}`	partial derivative, partial derivative, exterior derivative
$\phi\ \phi^*\ \phi_*$	`\ph \ph^* \ph_*`	diffeomorphism, pullback, pushforward
		Lie derivative, Lie

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Symbols

Symbol	LaTeX	Use
$\mathbb{R}$ $\mathbb{C}$ n $\underset{\cdot}{a}$	\mathbb{R} \mathbb{C} n \ud{a}	real numbers, complex numbers, dimension, Grassmann number
M T_pM T_p^*M	M T_p M T_p^* M	manifold, tangent space to M at point p, cotangent space to M at point p
x^i $\vec{\partial}_i$ $\vec{v}$ $\vec{\vec{l}}$	x^i \ve{\pa_i} \ve{v} \vv{l}	coordinates and coordinate basis vectors with coordinate indices, tangent vector, loop
t τ	t \ta	parameter time, proper time
$\underset{\sim}{dx^i}$ $\underset{\sim}{a}$ $\underset{\approx}{b}$ $\underset{\equiv}{c}$ $\underset{\sim}{f}$	\f{dx^i} \f{a} \ff{b} \fff{c} \nf{f}	coordinate basis 1-forms, 1-form, 2-form, 3-form, differential form of high or unspecified form grade
∂_i $\underset{\sim}{\partial}$ $\underset{\sim}{d}$	\pa_i \f{\pa} \f{d}	partial derivative, partial derivative, exterior derivative
ϕ ϕ^* ϕ_*	\ph \ph^* \ph_*	diffeomorphism, pullback, pushforward
$\mathcal{L}_{\vec{v}}$ $[\vec{v},\vec{u}]_L$ $\vec{\Delta}$	{\cal L}_{\ve{v}} \lb\ve{v},\ve{u}\rb_L \ve{\De}	Lie derivative, Lie bracket of two vector fields, distribution

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Symbol	LaTeX	Use
$\mathbb{R}\ \mathbb{C}\ n\ \underset{\cdot}{a}$	`\mathbb{R} \mathbb{C} n \ud{a}`	real numbers, complex numbers, dimension, Grassmann number
$M\ T_pM\ T_p^*M$	`M T_p M T_p^* M`	manifold, tangent space to M at point p, cotangent space to M at point p
$x^i\ \vec{\partial}_i\ \vec{v}\ \vec{\vec{l}}$	`x^i \ve{\pa_i} \ve{v} \vv{l}`	coordinates and coordinate basis vectors with coordinate indices, tangent vector, loop
$t\ \tau$	`t \ta`	parameter time, proper time
$\underline{dx^i}\ \underline{a}\ \underline{\underline{b}}\ \underline{\underline{\underline{c}}}\ \underset{\sim}{f}$	`\f{dx^i} \f{a} \ff{b} \fff{c} \nf{f}`	coordinate basis 1-forms, 1-form, 2-form, 3-form, differential form of high or unspecified form grade
$\partial_i\ \underline{\partial}\ \underline{d}$	`\pa_i \f{\pa} \f{d}`	partial derivative, partial derivative, exterior derivative
$\phi\ \phi^*\ \phi_*$	`\ph \ph^* \ph_*`	diffeomorphism, pullback, pushforward
$\mathcal{L}_{\vec{v}}\ [\vec{v},\vec{u}]_L\ \vec{\Delta}$	`{\cal L}_{\ve{v}} \lb\ve{v},\ve{u}\rb_L \ve{\De}`	Lie derivative, Lie bracket of two vector fields, distribution
$\underline{\vec{A}}\ \mathcal{L}_{\underset{\sim}{\vec{K}}}\ [\underset{\sim}{\vec{K}},\underset{\sim}{\vec{L}}]_L\ \underline{\vec{P}}$	`\f{\ve{A}} {\cal L}_{ \nf{\ve{K}} } \lb\nf{\ve{K}},\nf{\ve{L}}\rb_L \f{\ve{P}}`	vector valued form, FuN derivative, FuN bracket, vector projection
$\underline{\vec{\mathcal{A}}}\ \underline{\underline{\vec{\mathcal{F}}}}\ \underline{\mathcal{D}}$	`\f{\ve{\cal A}} \ff{\ve{\cal F}} \f{\cal D}`	Ehresmann connection, FuN curvature, Ehresmann covariant derivative
$\delta_i^j\ \eta_{\alpha\beta}\ \epsilon_{\alpha\ldots\beta}\ \otimes$	`\de_i^j \et_{\al \be} \ep_{\al \dots \be} \otimes`	Kronecker delta, Minkowski metric, permutation symbol, Kronecker product
$G\ g^-\ T_A\ [T_A,T_B]$	`G g^- T_A \lb{T_A,T_B}\rb`	Lie group, inverse of a group element, Lie algebra generators, commutator bracket

Symbols

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Symbol	LaTeX	Use
$\mathbb{R}\ \ \mathbb{C}\ \ n\ \ \underset{\cdot}{a}$	\mathbb{R} \mathbb{C} n \ud{a}	real numbers, complex numbers, dimension, Grassmann number
$M\ \ T_pM\ \ T_p^*M$	M T_p M T_p^* M	manifold, tangent space to M at point p, cotangent space to M at point p
$x^i\ \ \vec{\partial}_i\ \ \vec{v}\ \ \vec{\vec{l}}$	x^i \ve{\pa_i} \ve{v} \vv{l}	coordinates and coordinate basis vectors with coordinate indices, tangent vector, loop
$t\ \ \tau$	t \ta	parameter time, proper time
$\underset{\sim}{dx^i}\ \ \underset{\sim}{a}\ \ \underset{\approx}{b}\ \ \underset{\approx}{c}\ \ \underset{\sim}{f}$	\f{dx^i} \f{a} \ff{b} \fff{c} \nf{f}	coordinate basis 1-forms, 1-form, 2-form, 3-form, differential form of high or unspecified form grade
$\partial_i\ \ \underset{\sim}{\partial}\ \ \underset{\sim}{d}$	\pa_i \f{\pa} \f{d}	partial derivative, partial derivative, exterior derivative
$\phi\ \ \phi^*\ \ \phi_*$	\ph \ph^* \ph_*	diffeomorphism, pullback, pushforward
$\mathcal{L}_{\vec{v}}\ \ [\vec{v},\vec{u}]_L\ \ \vec{\Delta}$	{\cal L}_{\ve{v}} \lb\ve{v},\ve{u}\rb_L \ve{\De}	Lie derivative, Lie bracket of two vector fields, distribution
$\underset{\sim}{\vec{A}}\ \ \mathcal{L}_{\underset{\sim}{\vec{K}}}\ \ \left[\underset{\sim}{\vec{K}},\underset{\sim}{\vec{L}}\right]_L\ \ \underset{\sim}{\vec{P}}$	\f{\ve{A}} {\cal L}_{ \nf{\ve{K}} } \lb\nf{\ve{K}},\nf{\ve{L}}\rb_L \f{\ve{P}}	vector valued form, FuN derivative, FuN bracket, vector projection
$\underset{\sim}{\vec{\mathcal{A}}}\ \ \underset{\approx}{\vec{\mathcal{F}}}\ \ \underset{\sim}{\mathcal{D}}$	\f{\ve{\cal A}} \ff{\ve{\cal F}} \f{\cal D}	Ehresmann connection, FuN curvature, Ehresmann covariant derivative
$\delta_i^j\ \ \eta_{\alpha\beta}\ \ \epsilon_{\alpha\ldots\beta}\ \ \otimes$	\de_i^j \et_{\al \be} \ep_{\al \dots \be} \otimes	Kronecker delta, Minkowski metric, permutation symbol, Kronecker product
$G\ \ g^-\ \ T_A\ \ [T_A,T_B]$	G g^- T_A \lb{T_A,T_B}\rb	Lie group, inverse of a group element, Lie algebra generators, commutator bracket
$\underset{\sim}{\nabla}\ \ \underset{\sim}{A}\ \ \underset{\approx}{F}$	\f{\na} \f{A} \ff{F}	covariant derivative, connection, curvature
[illegible]	\f{\cal I} \f{\ve{\cal I}}	Maurer-Cartan form, Ehresmann-Maurer-Cartan

Symbols

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math meta editing

Symbol	LaTeX	Use
$\mathbb{R}$ $\mathbb{C}$ n $\underset{\cdot}{a}$	`\mathbb{R} \mathbb{C} n \ud{a}`	real numbers, complex numbers, dimension, Grassmann number
M T_pM T_p^*M	`M T_p M T_p^* M`	manifold, tangent space to M at point p, cotangent space to M at point p
x^i $\vec{\partial}_i$ $\vec{v}$ $\vec{\vec{l}}$	`x^i \ve{\pa_i} \ve{v} \vv{l}`	coordinates and coordinate basis vectors with coordinate indices, tangent vector, loop
t τ	`t \ta`	parameter time, proper time
$\underset{\sim}{dx^i}$ $\underset{\sim}{a}$ $\underline{\underline{b}}$ $\underline{\underline{\underline{c}}}$ $\underset{\sim}{f}$	`\f{dx^i} \f{a} \ff{b} \fff{c} \nf{f}`	coordinate basis 1-forms, 1-form, 2-form, 3-form, differential form of high or unspecified form grade
∂_i $\underset{\sim}{\partial}$ $\underset{\sim}{d}$	`\pa_i \f{\pa} \f{d}`	partial derivative, partial derivative, exterior derivative
ϕ ϕ^* ϕ_*	`\ph \ph^* \ph_*`	diffeomorphism, pullback, pushforward
$\mathcal{L}_{\vec{v}}$ $[\vec{v},\vec{u}]_L$ $\vec{\Delta}$	`{\cal L}_{\ve{v}} \lb\ve{v},\ve{u}\rb_L \ve{\De}`	Lie derivative, Lie bracket of two vector fields, distribution
$\underset{\sim}{\vec{A}}$ $\mathcal{L}_{\vec{K}}$ $\left[\vec{K},\vec{L}\right]_L$ $\underset{\sim}{\vec{P}}$	`\f{\ve{A}} {\cal L}_{ \nf{\ve{K}} } \lb\nf{\ve{K}},\nf{\ve{L}}\rb_L \f{\ve{P}}`	vector valued form, FuN derivative, FuN bracket, vector projection
$\underset{\sim}{\vec{\mathcal{A}}}$ $\underline{\underline{\vec{\mathcal{F}}}}$ $\underset{\sim}{\mathcal{D}}$	`\f{\ve{\cal A}} \ff{\ve{\cal F}} \f{\cal D}`	Ehresmann connection, FuN curvature, Ehresmann covariant derivative
δ_i^j $\eta_{\alpha\beta}$ $\epsilon_{\alpha\dots\beta}$ $\otimes$	`\de_i^j \et_{\al \be} \ep_{\al \dots \be} \otimes`	Kronecker delta, Minkowski metric, permutation symbol, Kronecker product
G g^- T_A $[T_A,T_B]$	`G g^- T_A \lb{T_A,T_B}\rb`	Lie group, inverse of a group element, Lie algebra generators, commutator bracket

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math
meta
editing

Symbol	LaTeX	Use
$\mathbb{R}\ \mathbb{C}\ n\ \underline{a}$	`\mathbb{R} \mathbb{C} n \ud{a}`	real numbers, complex numbers, dimension, Grassmann number
$M\ T_pM\ T_p^*M$	`M T_p M T_p^* M`	manifold, tangent space to M at point p, cotangent space to M at point p
$x^i\ \vec{\partial}_i\ \vec{v}\ \vec{\vec{l}}$	`x^i \ve{\pa_i} \ve{v} \vv{l}`	coordinates and coordinate basis vectors with coordinate indices, tangent vector, loop
$t\ \tau$	`t \ta`	parameter time, proper time
$\underline{dx}^i\ \underline{a}\ \underline{\underline{b}}\ \underline{\underline{\underline{c}}}\ \underset{\sim}{f}$	`\f{dx^i} \f{a} \ff{b} \fff{c} \nf{f}`	coordinate basis 1-forms, 1-form, 2-form, 3-form, differential form of high or unspecified form grade
$\partial_i\ \underline{\partial}\ \underline{d}$	`\pa_i \f{\pa} \f{d}`	partial derivative, partial derivative, exterior derivative
$\phi\ \phi^*\ \phi_*$	`\ph \ph^* \ph_*`	diffeomorphism, pullback, pushforward
$\mathcal{L}_{\vec{v}}\ [\vec{v},\vec{u}]_L\ \vec{\Delta}$	`{\cal L}_{\ve{v}} \lb\ve{v},\ve{u}\rb_L \ve{\De}`	Lie derivative, Lie bracket of two vector fields, distribution
$\underline{\vec{A}}\ \mathcal{L}_{\underset{\sim}{\vec{K}}}\ \left[\underset{\sim}{\vec{K}},\underset{\sim}{\vec{L}}\right]_L\ \underline{\vec{P}}$	`\f{\ve{A}} {\cal L}_{ \nf{\ve{K}} } \lb\nf{\ve{K}},\nf{\ve{L}}\rb_L \f{\ve{P}}`	vector valued form, FuN derivative, FuN bracket, vector projection
$\underline{\vec{\mathcal{A}}}\ \underline{\underline{\vec{\mathcal{F}}}}\ \underline{\mathcal{D}}$	`\f{\ve{\cal A}} \ff{\ve{\cal F}} \f{\cal D}`	Ehresmann connection, FuN curvature, Ehresmann covariant derivative
$\delta_i^j\ \eta_{\alpha\beta}\ \epsilon_{\alpha\ldots\beta}\ \otimes$	`\de_i^j \et_{\al \be} \ep_{\al \dots \be} \otimes`	Kronecker delta, Minkowski metric, permutation symbol, Kronecker product
$G\ g^-\ T_A\ [T_A,T_B]$	`G g^- T_A \lb{T_A,T_B}\rb`	Lie group, inverse of a group element, Lie algebra generators, commutator bracket
$\underline{\nabla}\ \underline{A}\ \underline{\underline{F}}$	`\f{\na} \f{A} \ff{F}`	covariant derivative, connection, curvature
[illegible]	`\f{\cal I} \f{\ve{\cal I}}`	Maurer-Cartan form, Ehresmann-Maurer-Cartan

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Symbol	Latex	Use
$\mathbb{R}\ \mathbb{C}\ n\ \underline{a}$	`\mathbb{R} \mathbb{C} n \ud{a}`	real numbers, complex numbers, dimension, Grassmann number
$M\ T_pM\ T_p^*M$	`M T_p M T_p^* M`	manifold, tangent space to M at point p, cotangent space to M at point p
$x^i\ \vec{\partial}_i\ \vec{v}\ \vec{\vec{l}}$	`x^i \ve{\pa_i} \ve{v} \vv{l}`	coordinates and coordinate basis vectors with coordinate indices, tangent vector, loop
$t\ \tau$	`t \ta`	parameter time, proper time
$\underline{dx}^i\ \underline{a}\ \underline{\underline{b}}\ \underline{\underline{\underline{c}}}\ \underset{\sim}{f}$	`\f{dx^i} \f{a} \ff{b} \fff{c} \nf{f}`	coordinate basis 1-forms, 1-form, 2-form, 3-form, differential form of high or unspecified form grade
$\partial_i\ \underline{\partial}\ \underline{d}$	`\pa_i \f{\pa} \f{d}`	partial derivative, partial derivative, exterior derivative
$\phi\ \phi^*\ \phi_*$	`\ph \ph^* \ph_*`	diffeomorphism, pullback, pushforward
$\mathcal{L}_{\vec{v}}\ [\vec{v},\vec{u}]_L\ \vec{\Delta}$	`{\cal L}_{\ve{v}} \lb\ve{v},\ve{u}\rb_L \ve{\De}`	Lie derivative, Lie bracket of two vector fields, distribution
$\underline{\vec{A}}\ \mathcal{L}_{\underset{\sim}{\vec{K}}}\ \left[\underset{\sim}{\vec{K}},\underset{\sim}{\vec{L}}\right]_L\ \underline{\vec{P}}$	`\f{\ve{A}} {\cal L}_{ \nf{\ve{K}} } \lb\nf{\ve{K}},\nf{\ve{L}}\rb_L \f{\ve{P}}`	vector valued form, FuN derivative, FuN bracket, vector projection
$\underline{\vec{\mathcal{A}}}\ \underline{\underline{\vec{\mathcal{F}}}}\ \underline{\mathcal{D}}$	`\f{\ve{\cal A}} \ff{\ve{\cal F}} \f{\cal D}`	Ehresmann connection, FuN curvature, Ehresmann covariant derivative
$\delta_i^j\ \eta_{\alpha\beta}\ \epsilon_{\alpha\dots\beta}\ \otimes$	`\de_i^j \et_{\al \be} \ep_{\al \dots \be} \otimes`	Kronecker delta, Minkowski metric, permutation symbol, Kronecker product
$G\ g^-\ T_A\ [T_A,T_B]$	`G g^- T_A \lb{T_A,T_B}\rb`	Lie group, inverse of a group element, Lie algebra generators, commutator bracket
$\underline{\nabla}\ \underline{A}\ \underline{\underline{F}}$	`\f{\na} \f{A} \ff{F}`	covariant derivative, connection, curvature
$\underline{\mathcal{I}}\ \underline{\vec{\mathcal{I}}}\ \vec{\xi}^L_A\ \vec{\xi}^R_A$	`\f{\cal I} \f{\ve{\cal I}} \ve{\xi^L_A} \ve{\xi^R_A}`	Maurer-Cartan form, Ehresmann-Maurer-Cartan form, left and right action vector fields
$Cl\ Cl^*$	`Cl Cl^*`	Clifford algebra, Clifford group

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[illegible]	\f{dx^I} \f{a} \ff{b} \fff{c} \nf{f}	form, differential form of high or unspecified form grade
∂_i $\underline{\partial}$ $\underline{d}$	\pa_i \f{\pa} \f{d}	partial derivative, partial derivative, exterior derivative
ϕ ϕ^* ϕ_*	\ph \ph^* \ph_*	diffeomorphism, pullback, pushforward
$\mathcal{L}_{\vec{v}}$ $[\vec{v},\vec{u}]_L$ $\vec{\Delta}$	{\cal L}_{\ve{v}} \lb\ve{v},\ve{u}\rb_L \ve{\De}	Lie derivative, Lie bracket of two vector fields, distribution
$\underline{\vec{A}}$ $\mathcal{L}_{\vec{K}}$ $[\vec{K},\vec{L}]_L$ $\underline{\vec{P}}$	\f{\ve{A}} {\cal L}_{ \nf{\ve{K}} } \lb\nf{\ve{K}},\nf{\ve{L}}\rb_L \f{\ve{P}}	vector valued form, FuN derivative, FuN bracket, vector projection
$\underline{\vec{\mathcal{A}}}$ $\underline{\underline{\vec{\mathcal{F}}}}$ $\underline{\mathcal{D}}$	\f{\ve{\cal A}} \ff{\ve{\cal F}} \f{\cal D}	Ehresmann connection, FuN curvature, Ehresmann covariant derivative
δ_i^j $\eta_{\alpha\beta}$ $\epsilon_{\alpha\ldots\beta}$ $\otimes$	\de_i^j \et_{\al \be} \ep_{\al \dots \be} \otimes	Kronecker delta, Minkowski metric, permutation symbol, Kronecker product
G g^- T_A $[T_A,T_B]$	G g^- T_A \lb{T_A,T_B}\rb	Lie group, inverse of a group element, Lie algebra generators, commutator bracket
$\underline{\nabla}$ $\underline{A}$ $\underline{\underline{F}}$	\f{\na} \f{A} \ff{F}	covariant derivative, connection, curvature
$\underline{\mathcal{I}}$ $\underline{\vec{\mathcal{I}}}$ $\vec{\xi}^L_A$ $\vec{\xi}^R_A$	\f{\cal I} \f{\ve{\cal I}} \ve{\xi^L_A} \ve{\xi^R_A}	Maurer-Cartan form, Ehresmann-Maurer-Cartan form, left and right action vector fields
Cl Cl^*	Cl Cl^*	Clifford algebra, Clifford group
γ_α $\gamma_{\alpha\ldots\beta}$ γ	\ga_\al \ga_{\al \dots \be} \ga	Clifford basis vectors, Clifford basis elements, Clifford pseudoscalar
$\hat{A}$ $\tilde{A}$ $\bar{A}$ $A^\dagger$ $\overline{A}$	\hat{ \tilde{ \bar{ \overline{A}^\dagger } } }	Clifford involution, reverse, conjugate, Hermitian conjugate, Dirac conjugate
$\cdot$ $\times$	\cdot \times	symmetric and antisymmetric Clifford algebra product
$[A,\ldots,B]_A$ $a_{[\alpha\ldots\beta]}$	\lb{A,\dots,B}\rb_A a_{\lb{\al\dots\be}\rb}	antisymmetric bracket, index bracket

$\underline{\vec{\mathcal{I}}}$ $\vec{\mathcal{I}}$ $\vec\xi^L_A$ $\vec\xi^R_A$	\ve{\xi^L_A} \ve{\xi^R_A}	Maurer-Cartan form, Ehresmann-Maurer-Cartan form, left and right action vector fields
Cl Cl^*	Cl Cl^*	Clifford algebra, Clifford group
γ_α $\gamma_{\alpha...\beta}$ γ	\ga_\al \ga_{\al \dots \be} \ga	Clifford basis vectors, Clifford basis elements, Clifford pseudoscalar
$\hat{A}$ $\tilde{A}$ $\bar{A}$ $A^\dagger$ $\overline{A}$	\hat{ \tilde{ \bar{ \overline{A}^\dagger } } }	Clifford involution, reverse, conjugate, Hermitian conjugate, Dirac conjugate
$\cdot$ $\times$	\cdot \times	symmetric and antisymmetric Clifford algebra product
$[A,\dots,B]_A$ $a_{[\alpha...\beta]}$	\lb{A,\dots,B}\rb_A a_{\lb{\al\dots\be}\rb}	antisymmetric bracket, index bracket
$\langle A\rangle_q$ $\langle A\rangle$	\li{A}\ri_q \li{A}\ri	Clifford grade q part, scalar part
$\underline{A}$ $\underline{\underline{b}}$ $\vec{e}$	\f{A} \ff{b} \ve{e}	Lieforms or Cliffords
$(e_i)^\alpha$ $(e_\alpha)^i$ g_{ij} $(\vec{u},\vec{v})$	\lp{e_i}\rp^\al \lp{e_\al}\rp^i g_{ij} \lp\ve{u},\ve{v}\rp	coframe matrix, frame matrix, metric, scalar product
$\underline{e}^\alpha$ $\vec{e}_\alpha$	\f{e^\al} \ve{e_\al}	coframe 1-forms, orthonormal basis vectors
$\underline{e}$ $\vec{e}$	\f{e} \lp{e_i}\rp^\al \ve{e} \lp{e_\al}\rp^i g_{ij}	coframe, frame
$\underset{\sim}{e}$ $\lvert e\rvert$	\nf{e} \ll{e}\rl	volume form, frame determinant
$\underset{\sim}{*f}$ $\underline{\vec{\vec{\epsilon}}}$	\nf{*f} \ff{ \vv{\ep} }	Hodge dual, Hodge dual projector
$\underline{e}^s$ $\left(e^s_i\right)^\alpha$ s	\f{e^s} \;\; \lp{e^s_i}\rp^\al \;\; s	special frame, special coframe matrix, conformal scalar
TM T^*M	TM T^*M	tangent bundle, cotangent bundle
$\Gamma^k{}_{ij}$ $\underline{\Gamma}^k{}_j$ $\underline{\underline{R}}^k{}_j$	\Ga^k{}_{ij} \f{\Ga}^k{}_j \ff{R}^k{}_j	Christoffel symbols, tangent bundle connection, Riemann curvature
$\underline{R}_j$ R	\f{R}{}_j R	Ricci curvature, curvature scalar

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(e_i) (e_α) g_{ij} (u,v)	`\lp\ve{u},\ve{v}\rp`	product
$\underset{\sim}{e}^\alpha$ $\vec{e}_\alpha$	`\f{e^\al} \ve{e_\al}`	coframe 1-forms, orthonormal basis vectors
$\underset{\sim}{e}$ $\vec{e}$	`\f{e} \lp{e_i}\rp^\al \ve{e} \lp{e_\al}\rp^i g_{ij}`	coframe, frame
$\underset{\approx}{e}$ $\lvert e \rvert$	`\nf{e} \ll{e}\rl`	volume form, frame determinant
$*\underset{\sim}{f}$ $\underset{\approx}{\vec{\vec{\epsilon}}}$	`\nf{*f} \ff{ \vv{\ep} }`	Hodge dual, Hodge dual projector
$\underset{\sim}{e}^s$ $\left(e^s_i\right)^\alpha$ s	`\f{e^s} \;\; \lp{e^s_i}\rp^\al \;\; s`	special frame, special coframe matrix, conformal scalar
TM T^*M	`TM T^*M`	tangent bundle, cotangent bundle
$\Gamma^k{}_{ij}$ $\underset{\sim}{\Gamma}^k{}_j$ $\underset{\approx}{R}^k{}_j$	`\Ga^k{}_{ij} \f{\Ga}^k{}_j \ff{R}^k{}_j`	Christoffel symbols, tangent bundle connection, Riemann curvature
$\underset{\sim}{R}_j$ R	`\f{R}{}_j R`	Ricci curvature, curvature scalar
$L^\beta{}_\alpha$ $\underset{\sim}{w}^\beta{}_\alpha$ $\underset{\approx}{F}^\beta{}_\alpha$	`L^\be{}_\al \f{w}^\be{}_\al \ff{F}^\be{}_\al`	Lorentz rotation, tangent bundle spin connection, Riemann curvature
ClM Cl^1M	`ClM Cl^1M`	Clifford bundle, Clifford vector bundle
$\underset{\sim}{A}$ $\underset{\sim}{\omega}$ $\underset{\approx}{R}$	`\f{A} \f{\om} \ff{R}`	Clifford connection, spin connection, Clifford-Riemann curvature
$\underset{\sim}{R}$ R	`\f{R} R`	Clifford-Ricci curvature, Clifford curvature scalar
$\underset{\approx}{T}$ $\underset{\sim}{\kappa}$	`\ff{T} \f{\ka}`	torsion, contorsion
$\underset{\sim}{C}$ $\underset{\approx}{\dot{B}}$ $\underset{\sim}{A}$ $\underset{\approx}{F}$	`\ud{C} \nf{\od{B}} \udf{A} \udff{F}`	BRST ghost, anti-ghost, extended connection, extended curvature

Editing, MainMenu, units

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$\langle A\rangle_q \ \langle A\rangle$	\li{A}\ri_q \li{A}\ri	Clifford grade *q* part, scalar part
$\underset{\sim}{A} \ \underset{\approx}{b} \ \vec{e}$	\f{A} \ff{b} \ve{e}	Lieforms or Cliffords
$(e_i)^\alpha \ (e_\alpha)^i \ g_{ij} \ (\vec{u},\vec{v})$	\lp{e_i}\rp^\al \lp{e_\al}\rp^i g_{ij} \lp\ve{u},\ve{v}\rp	coframe matrix, frame matrix, metric, scalar product
$\underset{\sim}{e}^\alpha \ \vec{e}_\alpha$	\f{e^\al} \ve{e_\al}	coframe 1-forms, orthonormal basis vectors
$\underset{\sim}{e} \ \vec{e}$	\f{e} \lp{e_i}\rp^\al \ve{e} \lp{e_\al}\rp^i g_{ij}	coframe, frame
$\underset{\equiv}{e} \ \lvert e\rvert$	\nf{e} \ll{e}\rl	volume form, frame determinant
$\underset{\sim}{*f} \ \underset{\approx}{\vec{\vec{\epsilon}}}$	\nf{*f} \ff{ \vv{\ep} }	Hodge dual, Hodge dual projector
$\underset{\sim}{e}^s \ \left(e^s_i\right)^\alpha \ s$	\f{e^s} \;\; \lp{e^s_i}\rp^\al \;\; s	special frame, special coframe matrix, conformal scalar
$TM \ T^*M$	TM T^*M	tangent bundle, cotangent bundle
$\Gamma^k{}_{ij} \ \underset{\sim}{\Gamma}^k{}_j \ \underset{\approx}{R}^k{}_j$	\Ga^k{}_{ij} \f{\Ga}^k{}_j \ff{R}^k{}_j	Christoffel symbols, tangent bundle connection, Riemann curvature
$\underset{\sim}{R}_j \ R$	\f{R}{}_j R	Ricci curvature, curvature scalar
$L^\beta{}_\alpha \ \underset{\sim}{w}^\beta{}_\alpha \ \underset{\approx}{F}^\beta{}_\alpha$	L^\be{}_\al \f{w}^\be{}_\al \ff{F}^\be{}_\al	Lorentz rotation, tangent bundle spin connection, Riemann curvature
$ClM \ Cl^1M$	ClM Cl^1M	Clifford bundle, Clifford vector bundle
$\underset{\sim}{A} \ \underset{\sim}{\omega} \ \underset{\approx}{R}$	\f{A} \f{\om} \ff{R}	Clifford connection, spin connection, Clifford-Riemann curvature
$\underset{\sim}{R} \ R$	\f{R} R	Clifford-Ricci curvature, Clifford curvature scalar
$\underset{\approx}{T} \ \underset{\sim}{\kappa}$	\ff{T} \f{\ka}	torsion, contorsion
$C \ \dot{\underset{\equiv}{B}} \ \underset{\sim}{A} \ \underset{\approx}{F}$	\ud{C} \nf{\od{B}} \udf{A} \udff{F}	BRST ghost, anti-ghost, extended connection, extended curvature

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$\langle A\rangle_q$ $\langle A\rangle$	`\li{A}\ri_q \li{A}\ri`	Clifford grade q part, scalar part
A $\underline{b}$ $\vec{e}$	`\f{A} \ff{b} \ve{e}`	Lieforms or Cliffords
$(e_i)^\alpha$ $(e_\alpha)^i$ g_{ij} $(\vec{u},\vec{v})$	`\lp{e_` [illegible]	[illegible] ix, metric, scalar
e^α $\vec{e}_\alpha$	[illegible]	[illegible] nal basis vectors
e $\vec{e}$	[illegible]	[illegible]
$\underline{e}$ $\lvert e\rvert$	[illegible]	[illegible] minant
$*f$ $\underline{\vec{\epsilon}}$	`\nf{*f} \ff{ \vv{\ep} }`	Hodge dual, Hodge dual projector
e^s $\left(e^s_i\right)^\alpha$ s	`\f{e^s} \;\; \lp{e^s_i}\rp^\al \;\; s`	special frame, special coframe matrix, conformal scalar
TM T^*M	`TM T^*M`	tangent bundle, cotangent bundle
$\Gamma^k{}_{ij}$ $\underline{\Gamma}^k{}_j$ $\underline{R}^k{}_j$	`\Ga^k{}_{ij} \f{\Ga}^k{}_j \ff{R}^k{}_j`	Christoffel symbols, tangent bundle connection, Riemann curvature
$\underline{R}_j$ R	`\f{R}{}_j R`	Ricci curvature, curvature scalar
$L^\beta{}_\alpha$ $\underline{w}^\beta{}_\alpha$ $\underline{F}^\beta{}_\alpha$	`L^\be{}_\al \f{w}^\be{}_\al \ff{F}^\be{}_\al`	Lorentz rotation, tangent bundle spin connection, Riemann curvature
ClM Cl^1M	`ClM Cl^1M`	Clifford bundle, Clifford vector bundle
$\underline{A}$ $\underline{\omega}$ $\underline{R}$	`\f{A} \f{\om} \ff{R}`	Clifford connection, spin connection, Clifford-Riemann curvature
$\underline{R}$ R	`\f{R} R`	Clifford-Ricci curvature, Clifford curvature scalar
$\underline{T}$ κ	`\ff{T} \f{\ka}`	torsion, contorsion
C $\underline{\dot{B}}$ $\underline{A}$ $\underline{F}$	`\ud{C} \nf{\od{B}} \udf{A} \udff{F}`	BRST ghost, anti-ghost, extended connection, extended curvature

You are now running on reserve battery power.

Please connect your computer to AC power. If you do not, your computer will go to sleep in a few minutes to preserve the contents of memory.

OK

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$\langle A\rangle_q \;\; \langle A\rangle$	`\li{A}\ri_q \li{A}\ri`	Clifford grade *q* part, scalar part
$\underset{\sim}{A} \;\; \underset{\approx}{b} \;\; \vec{e}$	`\f{A} \ff{b} \ve{e}`	Lieforms or Clifforms
$(\vec{e}_i)^\alpha \;\; (\underset{\sim}{e}_\alpha)^i \;\; g_{ij} \;\; (\vec{u},\vec{v})$	`\lp{e_i}\rp^\al \lp{e_\al}\rp^i g_{ij} \lp\ve{u},\ve{v}\rp`	coframe matrix, frame matrix, metric, scalar product
$\underset{\sim}{e}^\alpha \;\; \vec{e}_\alpha$	`\f{e^\al} \ve{e_\al}`	coframe 1-forms, orthonormal basis vectors
$\underset{\sim}{e} \;\; \vec{e}$	`\f{e} \lp{e_i}\rp^\al \ve{e} \lp{e_\al}\rp^i g_{ij}`	coframe, frame
$\underset{\sim}{e} \;\; \lvert e\rvert$	`\nf{e} \ll{e}\rl`	volume form, frame determinant
$*\underset{\sim}{f} \;\; \underset{\approx}{\vec{\vec{\epsilon}}}$	`\nf{*f} \ff{ \vv{\ep} }`	Hodge dual, Hodge dual projector
$\underset{\sim}{e}^s \;\; \left(e^s_i\right)^\alpha \;\; s$	`\f{e^s} \;\; \lp{e^s_i}\rp^\al \;\; s`	special frame, special coframe matrix, conformal scalar
$TM \;\; T^*M$	`TM T^*M`	tangent bundle, cotangent bundle
$\Gamma^k{}_{ij} \;\; \underset{\sim}{\Gamma}^k{}_j \;\; \underset{\approx}{R}^k{}_j$	`\Ga^k{}_{ij} \f{\Ga}^k{}_j \ff{R}^k{}_j`	Christoffel symbols, tangent bundle connection, Riemann curvature
$\underset{\sim}{R}_j \;\; R$	`\f{R}{}_j R`	Ricci curvature, curvature scalar
$L^\beta{}_\alpha \;\; \underset{\sim}{w}^\beta{}_\alpha \;\; \underset{\approx}{F}^\beta{}_\alpha$	`L^\be{}_\al \f{w}^\be{}_\al \ff{F}^\be{}_\al`	Lorentz rotation, tangent bundle spin connection, Riemann curvature
$ClM \;\; Cl^1M$	`ClM Cl^1M`	Clifford bundle, Clifford vector bundle
$\underset{\sim}{A} \;\; \underset{\sim}{\omega} \;\; \underset{\approx}{R}$	`\f{A} \f{\om} \ff{R}`	Clifford connection, spin connection, Clifford-Riemann curvature
$\underset{\sim}{R} \;\; R$	`\f{R} R`	Clifford-Ricci curvature, Clifford curvature scalar
$\underset{\approx}{T} \;\; \underset{\sim}{\kappa}$	`\ff{T} \f{\ka}`	torsion, contorsion
$C \;\; \dot{\underset{\sim}{B}} \;\; \underset{\sim}{A} \;\; \underset{\approx}{F}$	`\ud{C} \nf{\od{B}} \udf{A} \udff{F}`	BRST ghost, anti-ghost, extended connection, extended curvature