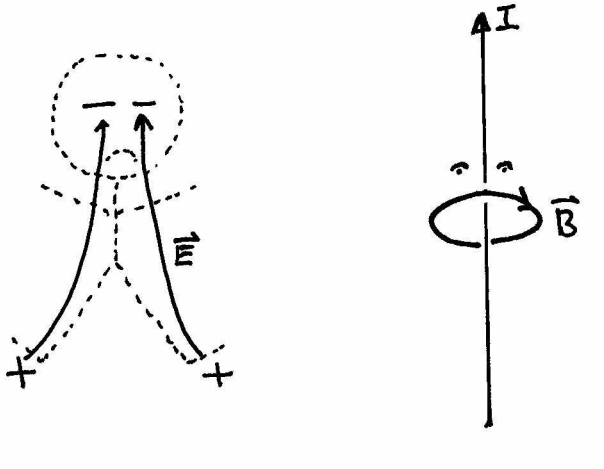
The Love Song of the Electric Field

Lyrics by Walter Smith, 11-01 (Chords by Marian McKenzie)

To the tune of "Loch Lomond"



Before they meet:

Gauss's Law:

$$\oint \vec{E} \cdot \hat{n}\, dA = \frac{Q}{e_o}$$

"Electric field lines start on positive charges, and end on negative charges."

Original Ampère's Law:

$$\oint \vec{B} \cdot d\vec{\ell} = m_o I$$

"Magnetic fields are created by currents."

No monopoles law: $\oint \vec{B} \cdot \hat{n}\, dA = 0$

"Magnetic field lines form closed loops."

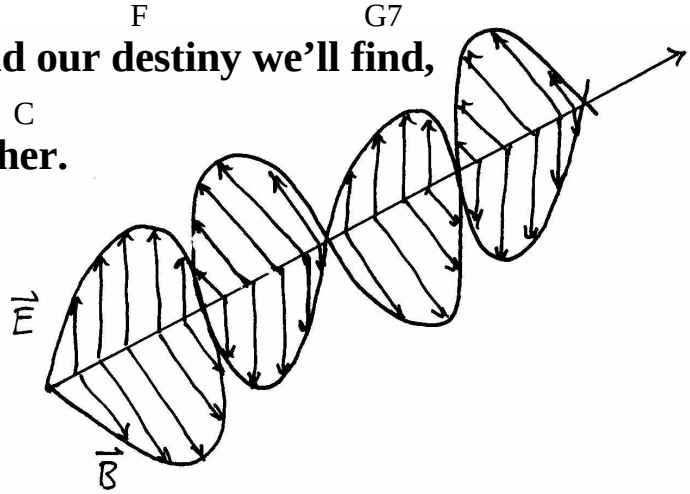
C F C F G7
Oh, you be the B field, and I'll be the E field,
C F C F G7
Let's dance through the cosmos, my lover!
F C F G7
With the ether set aside, you and I can freely glide,
C F C G7 C
Supported on the wings of each other.

C F C Dm G7
Before I met you, my skies were never blue.
C F C F G7
"My misery," I said, "just enlarges."
F Em Dm G7
My head was always stuck in that negative old muck,
C F C G7 C
And my feet were attached to plus charges.

C F C F G7
But then you came along with a different kind of song,
C F C F G7
Though it's true you were trapped 'round those currents.
F C F G7
But you had no start or end, you said, "Come along, my friend!
C F C G7 C
We don't need these monopoles, you've my assurance."

C F C F G7
You took me by the hand, and we jumped up off the land,
C F C F G7
And at first I was afraid it would pain me.
F C F G7
But I looked into your eyes, and it made me realize
C F C G7 C
That your d by dt could sustain me.

You said…
C F C F G7
You be the E field, and I'll be the B field,
C F C F G7
Let's dance through the cosmos, my lover!
F C F G7
We'll leave earthly Q's behind, and our destiny we'll find,
C F C G7 C
Supported on the wings of each other.



After they meet:

Faraday's Law

$$\oint \vec{E} \cdot d\vec{\ell} = -\frac{d}{dt}\int \vec{B} \cdot \hat{n}\, dA$$

"A changing magnetic field creates an electric field."

Maxwell's corrected version of Ampère's Law:

$$\oint \vec{B} \cdot d\vec{\ell} = m_o I + m_o e_o \frac{d}{dt}\int \vec{E} \cdot \hat{n}\, dA$$

"A changing electric field creates a magnetic field."