Some thoughts about spectrum regulation, past, present and future

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acoustic vs EM

- fixed rcvr (ears)
- fixed xmtr (voice)
- fixed protocol
- few kHz wide
- longitudinal wave
- ...

- choice of rcvr
- choice of xmtr
- choice of protocol(s)
- very many GHz wide
- transverse wave
- ...

Seems to me...

In our world each difference between acoustic waves and EM waves would suggest that EM waves need less regulation than acoustic.

(but more on that later)

But, but, but, but what about

Shannon's Capacity Theorem???

$$C = B \log_2 \left(1 + \frac{S}{N} \right)$$

what is not included in this picture?

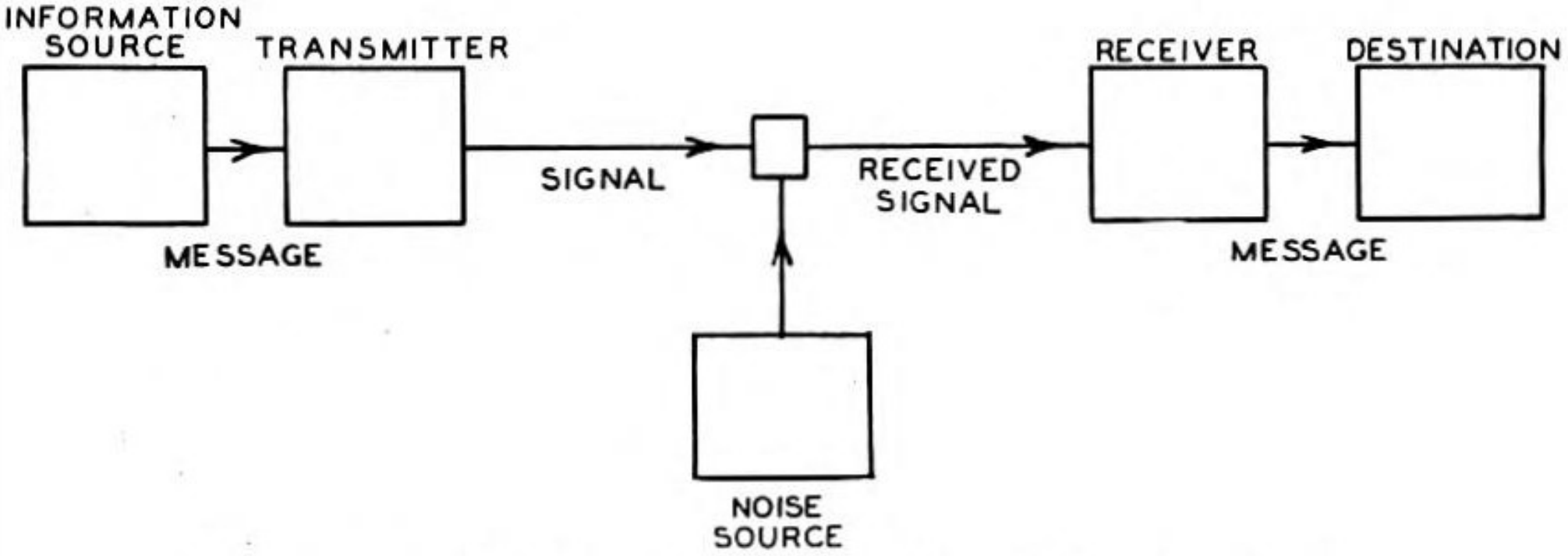

Fig. 1—Schematic diagram of a general communication system.

interference

But what exactly is interference?

interference

is a phenomena studied by economists

Radio waves do not interfere with each other.

They cross each other with zero interaction.

But wait! Radio interference is real!
(We all know this.)

What is going on?

Radio interference,

if it occurs,

happens entirely within the receiving apparatus.

And depends almost entirely on the receiver.

If you think some radio signals are
Interfering with each other,

you are undersampling

in space.

(credit: David P. Reed told me this. I wish I had thought of it.)

Light vs radio waves

radio waves	light
100s of meters	100s of nanometers

At what wavelength does it make sense to switch to thinking of EM waves as optical, for regulatory purposes?

back to reality....

A century ago, they didn't get it wrong.

Given the technology available at the time, the regulation was a good and valuable thing.

And as technology changed, it was still pretty much the right thing.

But what about now?

And what about a century from now?

If technology gets to the point where engineers can build reliable communication systems, reliable navigation systems, and reliable radar systems without protection from interference via government regulation of the spetcrum, why regulate it at all?

How soon will technology get there?

Is it already there?

Incremental change...

The investment in installed infrastructure needs to be protected for a while (decades).

Licenses today normally bundle permission to radiate with a legal protection from interference.

Start separating that.

Allow more “licensed by rule” operation (e.g. WiFi)

… and maybe it is receivers that need licensing, because it is the installed base of interference-prone receivers that locks things up.

What about amateur radio?

The National Parks of the Radio Spectrum

We should preserve some place for weak signal work, like the VHF contests, because of the value it provides in educating the next generation of radio engineers.