When Old Technologies Were New
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Ch 2: community and class order

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two narratives: electric promise vs electric threat
'electrician's: the IT professionals of the 90s
hype: Telephones make life easier and better.
electricity as transformative agent of social possibility
electricity: a natural force under control

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electrical communication makes interaction ‘strange’

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protected areas of family life...secrets laid open...
listening in on secrets (via switchboard..)
boundaries of public and private in flux
telephone conversation as evidence in court
new opportunities for infidelity, illicit behaviour..
new ways to fail (poor eloquence over the phone..)
new ways to breach boundaries to courtship outside social barriers..
(cross class romance)
start of the class of paparazzi

new ways to flout conventions (telephone girls)

escape from parental supervision..

electric light praised for middle-class virtues of beauty, purity, safety
electricity as replacement for servants..
Servants have more work (filter calls) because of the telephone
chief goal: improve efficiency of ordering and commanding...
ignorance (of people in things electric) makes people easier to control.

desire for simple and reliable devices...so they can be used by laymen

electrified domestic life should not change (who is in charge..)

burglar alarms appealing ... if they are simple.

electrically fortified castles (telephones for internal use only) communicating

securely (via push buttons) with the world..

tangible imprint of domesticity on technical devices..

phonographs store house calls -&gt; decorum of domestic sovereignty preserved -

-&gt;media to adorn, not change domestic life..

fear of contracting contagious diseases via the telephone..

outside of home: telephone mostly for men

telephone operators: the hello girls, give wake-up calls,

personal service providers..
asymmetries of class status (dress) rendered useless by the telephone..
new movement between classes possible via electricity

issue of interpreting presence and lack of it. (new: skype meetings)
recognizing a liar by his face/body language..
wrong people could be too familiar..
social distance and telephonic anonymity
telephone and good manners: profanity..

crimes of confidence..
telephone crime story → con-men on line. (new: credit card fraud)
women considered susceptible to male electric manipulation..
often successful if the perpetrator feigns membership in higher social class

belief that new technologies could help fight crime..
assist in police intelligence/surveillance
fire alarm and police telegraph..

death by electricity – connect to superstition to inflict horror..
1876 Alexander Graham Bell invented the telephone in Boston

1729 English chemist Stephen Gray transmitted electricity over a wire.
1800 Alessandro Volta produced the first battery.
1820 Danish physicist Christian Oersted discovered electromagnetism
1821 Michael Faraday reversed Oersted's experiment and discovered induction
1830 Joseph Henry transmitted the first practical electrical signal.

Samuel Morse invented the first workable telegraph
Johann Phillip Reis completed the first non-working telephone
World's first telephone directory, a single paper of only fifty names
Butterstamp telephone (receiver and transmitter in one handhold unit)

1854 Charles Bourseul, a French telegraphist, had conceived a plan for conveying sounds and even speech by electricity
1881 Metallic circuit (two wires connecting each telephone instead of one)
1885 AT&T
1889 First public coin telephone in Hartford, Connecticut
1906 Lee De Forest invents the three element electron tube
1915 First transcontinental telephone line between New York City and San Francisco
1937 Alec Reeves of Britain invents Pulse Code Modulation
1948 Transistor, joint invention of Bell Labs scientists William Shockley, John Bardeen, and Walter Brattain
Philipp Reis Frustrations

Philipp Reis imagined that electricity could be propagated through space, as light can, without the aid of a material conductor, and he performed some experiments on the subject. The results were described in a paper, "On the Radiation of Electricity," which, in 1859, he posted to Professor Poggendorff; for insertion in the then well-known periodical, Annalen der Physik. The manuscript was declined.

Reis had difficulty in interesting people in Germany in his invention despite demonstrating it to (among others) Wilhelm von Legat, Inspector of the Royal Prussian Telegraph Corps in 1862 (Legat, 1862). It aroused more interest in the United States In 1872, Prof Vanderwyde demonstrated Reis's device in New York where it was seen by Thomas Edison, and possibly officials of Western Union and Alexander Graham Bell. Bell, Edison and Berliner drew on Reis's device as a starting point in their subsequent development of components of the telephone..

The transmitter of Philipp Reis was based on the plan of interrupting the current, and the spring was intended to close the contact after it had been opened by the shock of a vibration. So long as the sound was a musical tone it proved efficient, for a musical tone is a regular succession of vibrations. But the vibrations of speech are irregular and complicated, and in order to transmit them the current has to be varied in strength without being altogether broken. The waves excited in the air by the voice should merely produce corresponding waves in the current. In short, the current ought to undulate in sympathy with the oscillations of the air. The Reis phone was poor at transmitting articulated speech, but conveyed the pitch of the sound well.

(Wikipedia and http://www.esanet.it/chez_basilio/reis.htm)
A LONG-DISTANCE TELEPHONE EXCHANGE.
Radio-telephone switchboard circa 1930. From the left the first four stations are to London, the next Ship to Shore, Buenos Aires, and Rio de Janeiro.
An early video phone (1950s)
Fighting crime with new communication technology

It should come as no news flash to you that there's no one easy way to stop crime. But it may surprise you to know that a lot of the job is wrapped up in one man. The guy whose job it is to get the police to the scene fast. The police dispatcher. As the calls come in, he has to track down the radio car closest to the scene.

And that's just for openers.
Because next he has to find out if it's available. And then get in touch with it by radio.
Which is exactly where our new crimestopper comes in. The digicom system from GTE Sylvania.

Digicom records the availability of all radio cars on a TV screen down at headquarters.

It even records their exact location. (When the radio patrolman touches a spot on his digimap, the same spot lights up on the dispatcher's duplicate map.)

As for the cop on patrol, with digicom in his car, he can actually run five license plate checks a minute directly through the state computer file. And check up on suspicious characters.

Unlike conventional radio, nobody can listen in, and the channels are never congested. Because digicom doesn't transmit voices. It transmits data. Electronically.

Naturally, all of this means a lot to the police, who need all the help they can get nowadays.

The cop on the spot can make faster decisions, because he's better informed.

That goes for the dispatcher, too.

But it also means something to the average citizen. Knowing which car to send where can not only save time, but lives. And at the very least, can just plain get help to a lot of people fast.

Of course, the police can't carry digicom around with them like Dick Tracy's wrist-radio.

Yet.
Mobile Phone Technology

Mobile phone are low-power transmitters that send and receive voice and data to/from the nearest cell sites (usually not more than 5 to 8 miles away). When the mobile phone is turned on, it registers with the mobile telephone exchange, or switch, with its unique identifier, and will then be alerted by the mobile switch when there is an incoming telephone call. The phone constantly listens for the strongest signal being received from the surrounding base stations. As the user moves around the network, the mobile device will "handoff" to various cell sites (base stations) during calls, or while waiting (idle) between calls it will reselect cell sites.

Cell sites have relatively low-power (often only one or two watts) radio transmitters which broadcast their presence and relay communications between the mobile handsets and the switch. The switch in turn connects the call to another subscriber of the same wireless service provider or to the public telephone network, which includes the networks of other wireless carriers. Many of these sites are camouflaged to blend with existing environments, particularly in scenic areas.

Digital mobile phones convert voice signals to binary information through analog to digital conversion and compress the digital stream.

The dialogue between the handset and the cell site is a stream of digital data that includes digitized audio. The technology that achieves this depends on the system which the mobile phone operator has adopted, such as GSM, CDMA and TDMA.
GSM: Groupe Spécial Mobile

- Good subjective speech quality
- Most popular mobile phone standard
- Low terminal and service cost
- Support for international roaming
- Ability to support hand-held terminals
- ISDN compatibility
- Short Message Service (SMS)
- 890-915 MHz for the uplink and 935-960 MHz for the downlink
- Combination of Time- and Frequency-Division Multiple Access (TDMA/FDMA)

Used by 2 billion people in more than 212 countries
Structure of a GSM network (key elements)

**Interface Names**

- BTS: base station receiver
- BSS: base station subsystem
- MSC: mobile switching center
- HLR: home location register
- AUC: authentication center
- GGSN: gateway support node
- GPRS: general packet radio service
- PSTN: public switched telephone network
- NSS: network subsystem
- SGSN: service GPRS support node

**Glossary:**
http://www.gsmworld.com/technology/glossary.shtml

**Image source:** wikipedia
In a cellular system, as the distributed mobile transceivers move from cell to cell during an ongoing continuous communication, switching from one cell frequency to a different cell frequency is done electronically without interruption and without a base station operator or manual switching. This is called the handoff.

Typically, a new channel is reserved for the mobile unit on the new base station which will serve it. The mobile unit then automatically switches from the current channel to the new channel and communication continues.

http://en.wikipedia.org/wiki/Cellular_network
Traffic Channel (TCH): 26 TDMA frames @ 120ms each

Frames 0-11: Traffic CH  frames 12: Control CH  frames 13-24: Traffic CH  frame 25: unused

26 frames: 120ms

TDMA frame (8 bursts): 60/13ms

burst: 15/26ms

3 tail bits  57 data bits  26 training bits  57 data bits  3 tail bits  guard bits
SIM Cards

One of the key features of GSM is the Subscriber Identity Module, commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information and phone book. This allows the user to retain his or her information after switching handsets. Alternatively, the user can also change operators while retaining the handset simply by changing the SIM. Some operators will block this by allowing the phone to use only a single SIM, or only a SIM issued by them; this practice is known as SIM locking.

GSM security

Communications between the subscriber and the base station can be encrypted. GSM only authenticates the user to the network (and not vice versa). The security model therefore offers confidentiality and authentication, but limited authorization capabilities. GSM uses several cryptographic algorithms for security. The A5/1 and A5/2 stream ciphers are used for ensuring over-the-air voice privacy. Serious weaknesses have been found in both algorithms.
Time Division Multiple Access (TDMA)

TDMA allows several users to share the same frequency channel by dividing the signal into different time slots. The users transmit in rapid succession, one after the other, each using his own time slot. This allows multiple stations to share the same transmission medium (e.g. radio frequency channel) while using only a part of its channel capacity.

Speech coding: Pulse Coded Modulation (PCM) with linear prediction

Information from previous samples, which does not change very quickly, is used to predict the current sample. The coefficients of the linear combination of the previous samples, plus an encoded form of the residual, the difference between the predicted and actual sample, represent the signal.

Multi path equalization

At the 900 MHz range, radio waves bounce off everything - buildings, hills, cars, airplanes, etc. Thus many reflected signals, each with a different phase, can reach an antenna. Equalization is used to extract the desired signal from the unwanted reflections.
Frequency hopping

Moving between a transmit, receive, and monitor time slot within one TDMA frame; normally on different frequencies. GSM makes use of this inherent frequency agility to implement slow frequency hopping, where the mobile and BTS transmit each TDMA frame on a different carrier frequency.

Discontinuous transmission

DTX takes advantage of the fact that a person speaks less than 40 percent of the time in normal conversation, by turning the transmitter off during silence periods.

Comfort noise

When the transmitter is turned off, there is total silence heard at the receiving end, due to the digital nature of GSM. To assure the receiver that the connection is not dead, comfort noise is created at the receiving end by trying to match the characteristics of the transmitting end's background noise.
17:56pm

Menu

THIS HANDSET IS STOLEN, BUYING OR SELLING IT IS A CRIME
–THE POLICE

Back
Twitter is a free social networking and microblogging service that enables its users to send and read messages known as tweets. Tweets are text-based posts of up to 140 characters displayed on the author's profile page and delivered to the author's subscribers who are known as followers. Senders can restrict delivery to those in their circle of friends or, by default, allow open access. Users can send and receive tweets via the Twitter website, Short Message Service (SMS) or external applications.
Pedro Sepulveda- Sandoval, digital shelter