

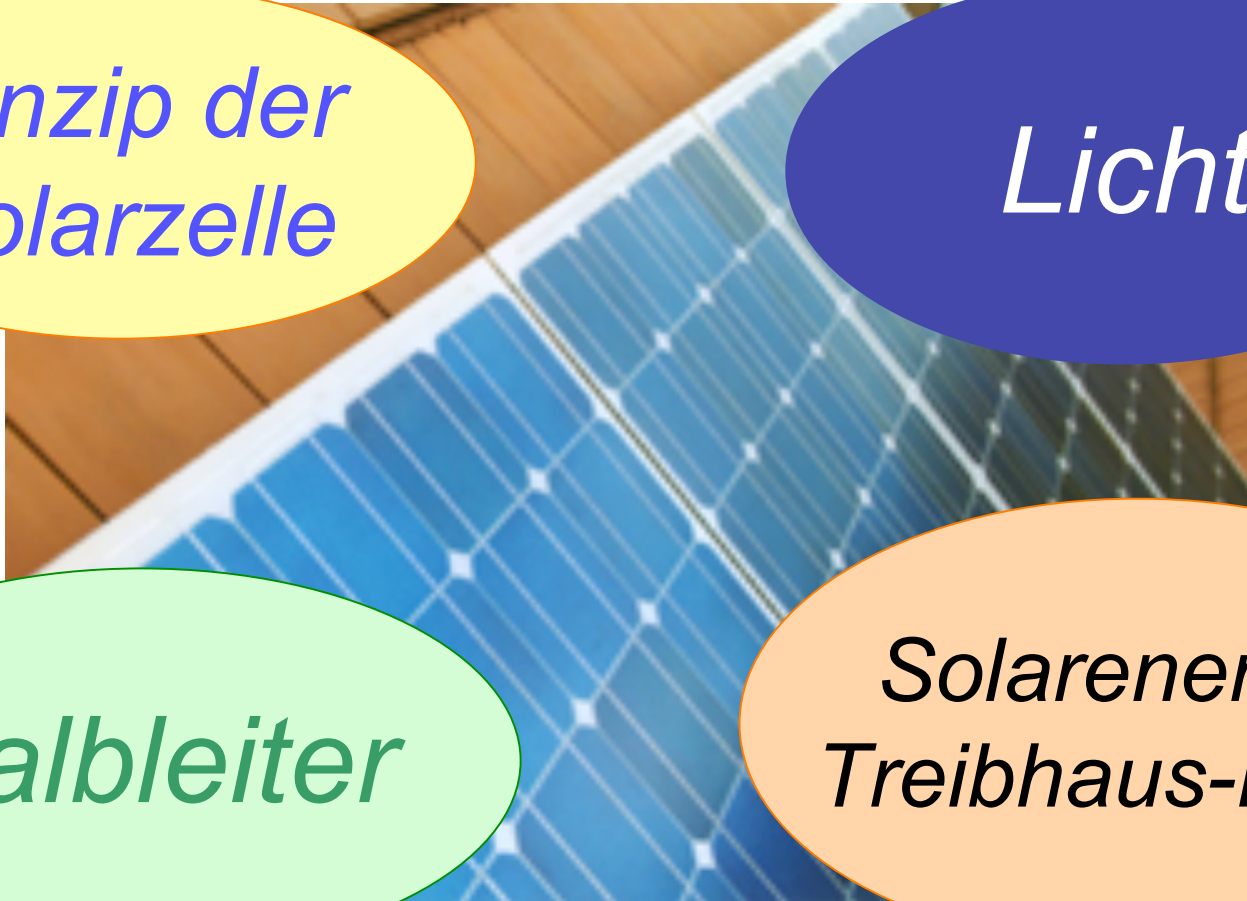
Solarzelle

*Prinzip der
Solarzelle*

Licht

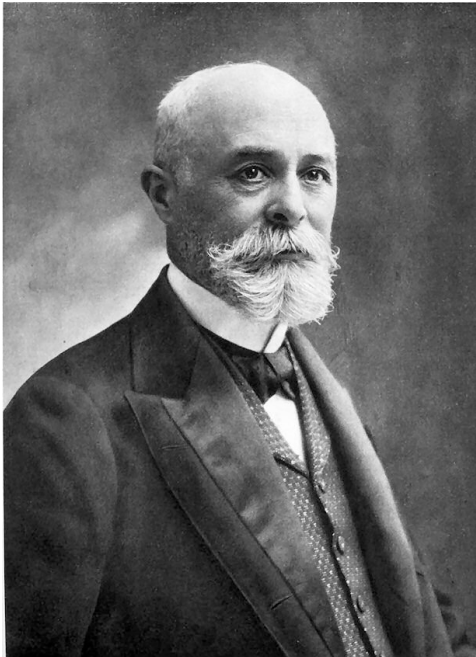
Halbleiter

*Solarenergie:
Treibhaus-Effekt*



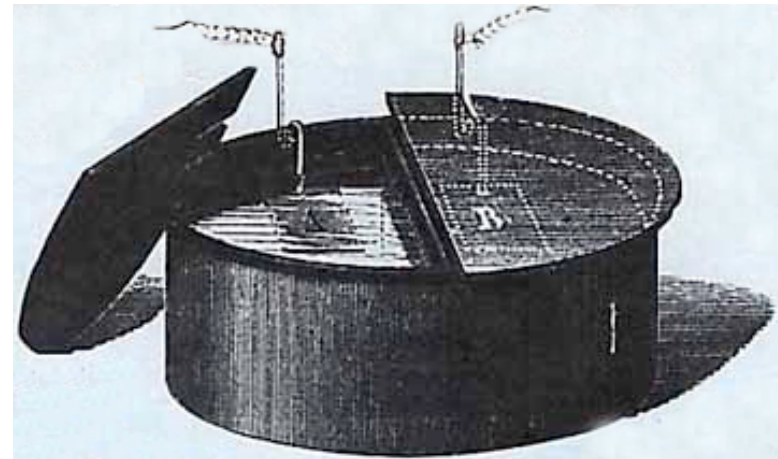
Geschichte der Solar-Zelle

1839: Alexandre Edmond Becquerel
Experiment mit Metal-Elektroden in Elektrolyt



Alexandre Edmond Becquerel
(1820-1891)

Spannungsanstieg unter Beleuchtung



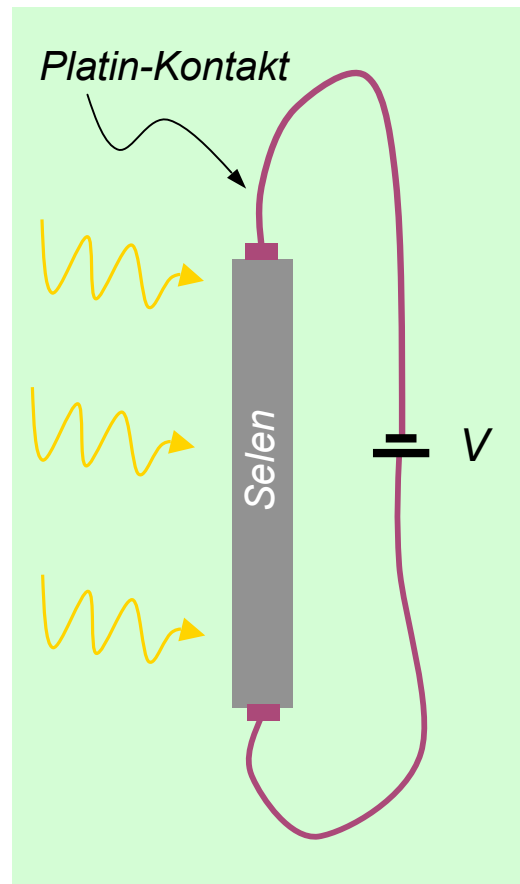
1873: Willoughby Smith entdeckt

Photowiderstand in Selen mit Platin-Kontakten

Leitfähigkeit steigt unter Beleuchtung



Willoughby Smith
(1828-1891)



*EFFECT OF LIGHT ON SELENIUM DURING THE PASSAGE OF AN ELECTRIC CURRENT.**

BEING desirous of obtaining a more suitable high resistance for use at the Shore Station in connection with my system of testing and signalling during the submersion of long submarine cables, I was induced to experiment with bars of selenium, a known metal of very high resistance. I obtained several bars varying in length from 5 to 10 centimetres, and of a diameter from 1 to $1\frac{1}{2}$ millimetres. Each bar was hermetically sealed in a glass tube, and a platinum wire projected from each end for the purpose of connection.

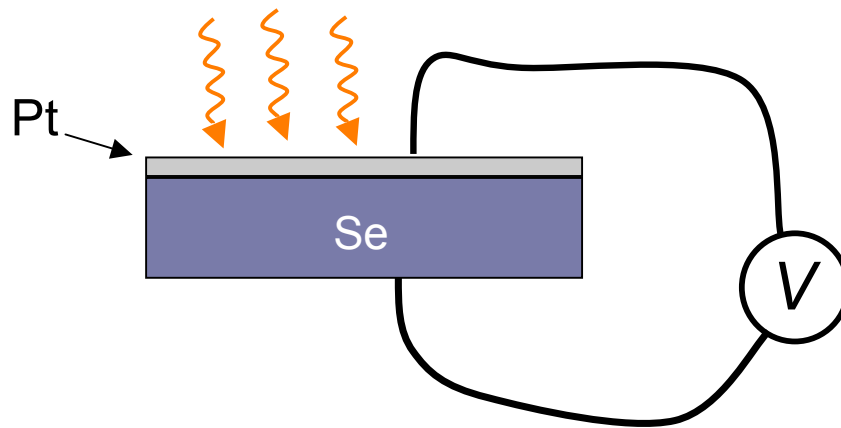
The early experiments did not place the selenium in a very favourable light for the purpose required, for although the resistance was all that could be desired—some of the bars giving 1,400 megs. absolute—yet there was a great discrepancy in the tests, and seldom did different operators obtain the same result. While investigating the cause of such great differences in the resistance of the bars, it was found that the resistance altered materially according to the intensity of light to which it was subjected. When the bars were fixed in a box with a sliding cover, so as to exclude all light, their resistance was at its highest, and remained very constant, fulfilling all the conditions necessary to my requirements; but immediately the cover of the box was removed, the conductivity increased from 15 to 100 per cent. according to the intensity of the light falling on the bar. Merely intercepting the light by passing the hand before an ordinary gas-burner placed several feet from the bar increased the resistance from 15 to 20 per cent. If the light be intercepted by rock salt or by glass of various colours, the resistance varies according to the amount of light passing through the glass.

To ensure that temperature was in no way affecting the experiments, one of the bars was placed in a trough of water so that there was about an inch of water for the light to pass through, but the results were the same; and when a strong light from the ignition of a narrow band of magnesium was held about nine inches above the water the resistance immediately fell more than two-thirds, returning to its normal condition immediately the light was extinguished.

*"Effect of Light on Selenium during the passage of an Electric Current",
Nature, 20 February 1873, p.303.*

1876: William Grylls Adams (1836-1915) and Richard E. Day

Experimente mit Selen-Platin-Kontakten ergeben endliche Spannung/Strom



Wirkungsgrad $\eta = \frac{P_E}{P_L}$

P_E : elektrische Leistung
 P_L : Leistung des Lichtes

$\eta \sim 1\%$

1883: Charles Fritts

Solarzelle: Goldfilm auf Selen

$\eta \sim 2\%$

Frühe Anwendungen

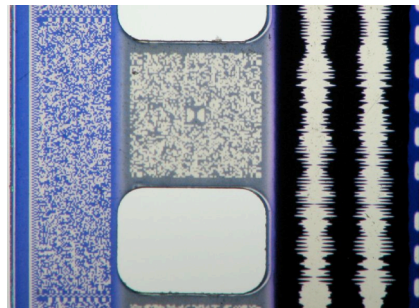
- Belichtungsmesser



- Bildübertragung

- Tonfilm

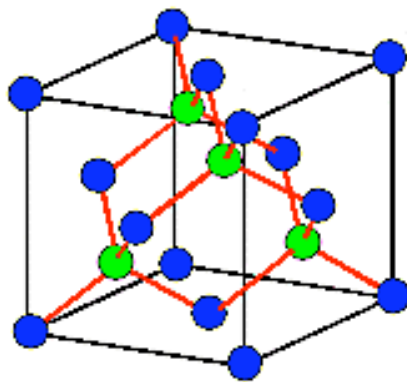
Tonspur



Halbleiter - Silizium

frühes 20. Jh.: Herstellung von hochreinem Silizium

1918: Jan Cyochralski Si-Einkristalle

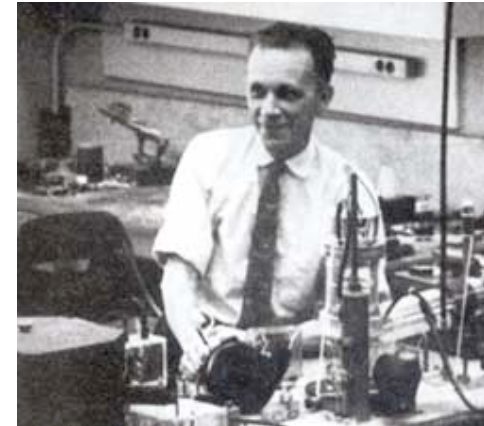


	IIIA	IVA	VA	VI	
	5 B	6 C	7 N	8 O	Isolator
	13 Al	14 Si	15 P	16 S	Halbleiter
30 Zn	31 Ga	32 Ge	33 As	34 Se	Halbmetall
48 Cd	49 In	50 Sn	51 Sb	52 Te	
80 Hg	81 Tl	82 Pb	83 Bi	84 Po	Metall

Solarzellen aus Silizium

1940: Russel Ohl (1898-1987)
Photoelektrischer Effekt in Silizium-Proben

Experimente mit pn-Kontakten
in den Bell-Labs



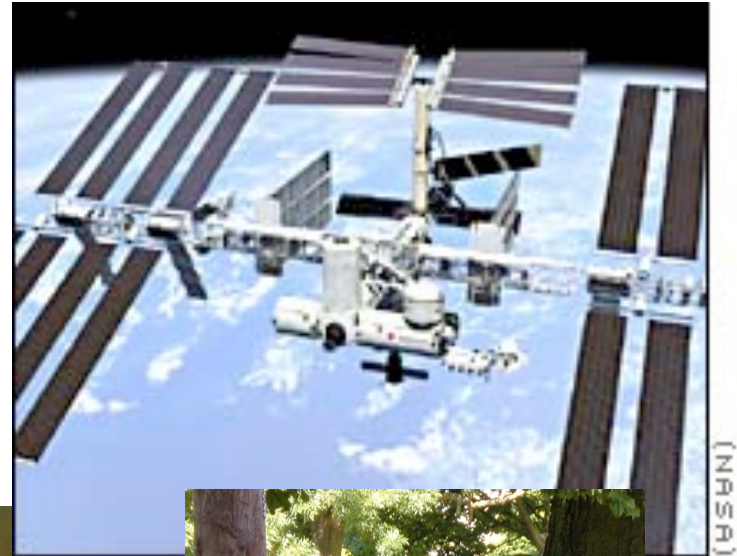
1954: Charles Pearson
Daryll Chapin
Calvin Fuller

entwickeln die moderne
Solarzelle

Wirkungsgrad: 4 ~ 11%



Verwendung von Solarzellen



Struktur und Prinzip einer Solarzelle

