

雷達的趣聞

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烏克蘭與俄羅斯戰爭中使用的雷達技術玲瓏滿目。這些技術涉及監視雷達、防空雷達，以及由雙方部署的戰場監視系統。這些雷達系統用於偵測飛機、導彈或地面活動的系統。

這些雷達技術是哪些厲害人物發明的？

麻省理工學院輻射實驗室在第二次世界大戰時期將電磁波的研究發揮得淋漓盡致，對於雷達（Radar）的發展有不可磨滅的貢獻，也產生出多位諾貝爾獎得主，包括創造「核磁共振」這個名詞的拉比（Isidor Isaac Rabi, 1898 ~ 1988），在 1937 年確實證原子核的角動量，而於 1944 年獲頒諾貝爾物理獎。薄賽爾（Edward Purcell, 1912 ~ 1997）與布洛赫（Felix Bloch, 1905 ~ 1983）因發現在外加磁場下，所有物質只要有奇數個質子或中子皆可以形成共振現象，能發射特定射頻信號，而在 1952 年榮獲諾貝爾物理獎。這項發現早期應用在化學物質的檢測上。薄賽爾得諾貝爾獎時好像只有發表 6 篇論文。



拉比（Isidor Isaac Rabi, 1898 ~ 1988）。



薄賽爾（Edward Purcell, 1912 ~ 1997）。

阿瓦雷茲（L.W. Alvarez, 1911 ~ 1988）因製成第一部質子直線加速器，以及對基本粒子研究發展的貢獻，而榮獲諾貝爾物理獎。冉濟（Norman F. Ramsey, 1915~2011）發展出分離的震盪場方法及其在氫邁射和其他原子鐘上的應用。

第二次世界大戰期間列強的戰爭需求使得先進科學技術得以快速的發展，於是雷達就出現了。大戰期間，德國空軍老是跨海轟炸倫敦，讓英國煩不勝煩，急需一種探測空中金屬物體的技術，能在反空襲戰中幫助搜尋德國飛機。

雷達的最早構想來自於沃森瓦爵士（Sr. Robert Watson-Watt, 1892 ~ 1973），希望與美國攜手合作，共同打擊德軍。於是上述這群偉大科學家的電磁波研究集中火力，在戰爭時期發展出地對空、空對地搜索轟炸、空對空截擊火控，以及敵我識別功能的雷達技術，德軍聞之喪膽。

戰後雷達有多項民生應用。例如微波爐（所謂的「雷達烤箱」）深受家庭主婦喜愛；雷達測速器則成為汽車超速者的剋星。沃森瓦開車超速曾被雷達測速器抓到罰錢，對於自己推動這項發明的應用，反讓他自食惡果，啼笑皆非。



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現為國立陽明交通大學資工系終身講座 教授暨華邦電子講座，曾任科技部次長，為 ACM Fellow、IEEE Fellow、AAAS Fellow 及 IET Fellow。研究興趣為物聯網、行動計算及系統模擬，發展出一套物聯網系統 IoTtalk，廣泛應用於智慧農業、智慧教育、智慧校園等領域 / 場域。興趣多元，喜好藝術、繪畫、寫作，遨遊於科技與人文間自得其樂，著有 < 閃文集 >、< 大橋驟雨 >。

Fun Facts about Radar

Various radar technologies have been utilized in the Ukraine-Russia war, including surveillance radar, anti-aircraft radar, and battlefield monitoring systems deployed by both parties. These radar systems are used to detect aircraft, missiles, and ground activities.

Who were the brilliant minds behind the pioneering radar technologies?

During World War II, the Radiation Laboratory at the Massachusetts Institute of Technology excelled in studying electromagnetic waves and made significant contributions to radar development. The laboratory also produced several Nobel Prize winners, including Isidor Isaac Rabi (1898-1988), who coined the term "Nuclear magnetic resonance" and confirmed nuclear angular momentum in 1937, subsequently awarded the Nobel Prize in Physics in 1944. Edward Purcell (1912-1997) and Felix Bloch (1905-1983) discovered that substances with an odd number of protons or neutrons can undergo resonance under an external magnetic field, emitting specific radio frequency signals. They were jointly awarded the Nobel Prize in Physics in 1952. This discovery was initially applied to chemical analysis. Purcell reportedly had only six published papers at the time of receiving the Nobel Prize.

Luis W. Alvarez (1911-1988) was awarded the Nobel Prize in Physics for constructing the first proton linear accelerator and for his contributions to the study of elementary particles. Norman F. Ramsey (1915-2011) developed the separated oscillatory field method and applied it to hydrogen masers and other atomic clocks.

During World War II, the military needs of major powers accelerated the rapid development of advanced scientific technologies, leading to the creation of radar. The relentless bombings of London by the German Luftwaffe from across the sea greatly troubled the

United Kingdom during the war. This prompted a pressing need for technology capable of detecting metallic objects in the air to aid in locating German aircraft during air defense operations.

Sir Robert Watson-Watt (1892-1973) developed the earliest concept of radar with the aim of collaborating with the United States to counter the German military. This collaboration led to a focused effort among scientists to research electromagnetic waves during the war. Their work resulted in the development of radar technologies for ground-to-air and air-to-ground bombing searches, air-to-air interception fire control, and enemy identification capabilities, which significantly impacted the German military.

After the war, radar technology found various civilian applications. For example, the microwave oven, nicknamed the "radar oven," became popular among housewives. Radar speed guns were used to deter speeding drivers. Sir Robert Watson-Watt was once caught speeding by a radar speed gun and fined. He experienced firsthand the consequences of his invention's adaptation, which elicited mixed feelings of irony and amusement.

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