Fermi Sea

By Camille Bernal-Choban

In the depths of a lattice, particles called electrons glide;
Forming a quantum sea where mysteries hide;
The Fermi Sea is a place so deep;
That even the particles find it hard to sleep;

Near absolute zero although they stand ordered, it is not hand in hand;
For electrons are fermions, and they form an unfriendly band;

Although they dance all around;
One rule must abound;
Each state is filled with only one—no more can fit;
For Pauli's principle simply won't permit.

The slowest of them all reaches for a state;
It's the lowest energy, making the others irate;
Up comes the second, not quite as slow;
To claim its spot, and wouldn't you know?
Here comes the third;
Oh, my word!

It's become a true grabbing fest,
Each snatching up the next quantum best.

As the battle rages on within the deep,
More and more begin to grasp and keep;
And, there are tons of these you see;
More than you and I could ever believe—
On the order of ten to the twenty-three.

At last a boundary is reached;
The fermi level, the peak.
And at this level in the sea of states high and low;
electricity can flow.

But when disorder creeps inside; The sea grows restless, far and wide. The Fermi level shifts its place,
Now a jagged path through phase and space.

But as entropy's hand begins to grow, It distrubs the order and warps the flow. Yet through the chaos,
still electrons keep, Their essence firm beneath the deep.

And, lying deep within a lattice's core,
The Fermi Sea remains forevermore,
A dance of states, a quantum feat,

And in this strange sea, our minds meet.