```
<!DOCTYPE html>
<html lang="zh">
<head>
<meta charset="UTF-8">
<title>圆轴扭转变形动画（增强版）</title>
<style>
body{
    margin:0;
    font-family:Arial;
    display:flex;
    flex-direction:column;
    height:100vh;
    background:#f5f5f5;
}

#top{
    flex:3;
    display:flex;
    justify-content:center;
    align-items:center;
    background:white;
}

canvas{
    background:white;
    border:1px solid #ccc;
}

#bottom{
    flex:1;
    padding:15px;
    background:#eee;
}

input[type=range]{
    width:400px;
}
</style>
</head>

<body>

<div id="top">
<canvas id="c" width="700" height="400"></canvas>
```

```
</div>

<div id="bottom">
<div>
扭矩 T：<span id="T">50</span> N·m
</div>

<input type="range" min="0" max="100" value="50" id="slider">

<div style="margin-top:10px">
最大剪应力 τ max：<span id="tau">0</span><br>
扭转角 φ（可视化）：<span id="phi">0</span>
</div>
</div>

<script>
const c = document.getElementById("c");
const ctx = c.getContext("2d");

const slider = document.getElementById("slider");
const Ttxt = document.getElementById("T");
const tautxt = document.getElementById("tau");
const phitxt = document.getElementById("phi");

const R = 80;
const L = 300;
const J = 1e6;

// 👉 放大系数（让变形明显）
const deformScale = 0.8;

function draw(T){

    ctx.clearRect(0,0,700,400);

    const cx = 200;
    const cy = 200;

    // ===== 1. 扭转角（人为放大用于教学）=====
    const phi = T * 0.02; // 可视化角度
    const tauMax = T * R / J;

    // ===== 2. 画“扭转圆柱网格” =====
    for(let i=0;i<12;i++){
```

```
        const x0 = cx - L/2;
        const x1 = cx + L/2;

        ctx.beginPath();

        for(let x=x0;x<=x1;x+=10){

            const t = (x - x0)/L;

            const twist = phi * t;

            const yTop = cy - R;
            const yBottom = cy + R;

            const offsetX = Math.sin(twist) * R * deformScale;

            if(x===x0){
                ctx.moveTo(x + offsetX, yTop + i*(2*R/12));
            }else{
                ctx.lineTo(x + offsetX, yTop + i*(2*R/12));
            }
        }

        ctx.strokeStyle = "#444";
        ctx.stroke();
}

// ===== 3. 画左右端面 =====
ctx.beginPath();
ctx.arc(cx - L/2, cy, R, 0, Math.PI*2);
ctx.stroke();

ctx.beginPath();
ctx.arc(cx + L/2, cy, R, 0, Math.PI*2);
ctx.stroke();

// ===== 4. 扭转箭头 =====
ctx.beginPath();
ctx.arc(cx + L/2, cy, 30, 0, phi);
ctx.strokeStyle="red";
ctx.stroke();

// ===== 5. 更新数值 =====
```

```
        Ttxt.textContent = T;
        tautxt.textContent = tauMax.toFixed(6);
        phitxt.textContent = phi.toFixed(2) + " rad";
}

// 初始化

draw(50);

slider.oninput = function(){
        draw(Number(this.value));
}
</script>

</body>
</html>
```