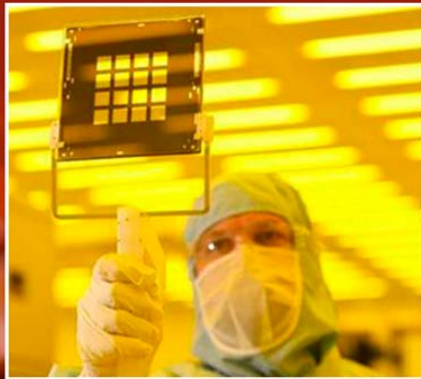


**Holding Ourselves To A
Higher Standard**



**Your Merchant Source For
Trusted Photomasks**

**Barbara Lauche
Erik Bemann
Jeffrey Hubers van Assenraad**

14th May 2019



PHOTRONICS
50 Years. Trusted. Global Leader.



Agenda:

- 1. Brief company presentation**
- 2. Experience on entering and working on the local market**
- 3. Q&A session**

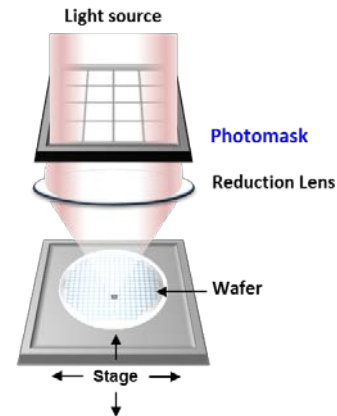
Photomasks - Critical to Electronic Manufacturing

Component
Design

Photomask

Manufacturing
Process

End
User



Photomasks – not materials!



About Photronics

Established in **1969** (starting in a garage), the Company became a publicly-held corporation in **1987** and today operates **eleven manufacturing facilities** around the globe working together with 1550 colleagues.

Today Photronics turned into a worldwide leader in **Precision Reticle and Photomask** technologies for Semiconductor & Microelectronic applications (IC) and the **Flat Panel Display** (FPD) industry.

We are proudly celebrating our 50th year of helping customers solve their **photolithography challenges** and **optimize their manufacturing yields**.

From Peter, our CEO: *"The microelectronics industry has changed significantly over the last 50 years, and we are honoured to play an important role in its ongoing advancement"*

From our Founder: *"From the very beginning, Photronics was founded on the basic principal of providing outstanding customer service at a great value"*

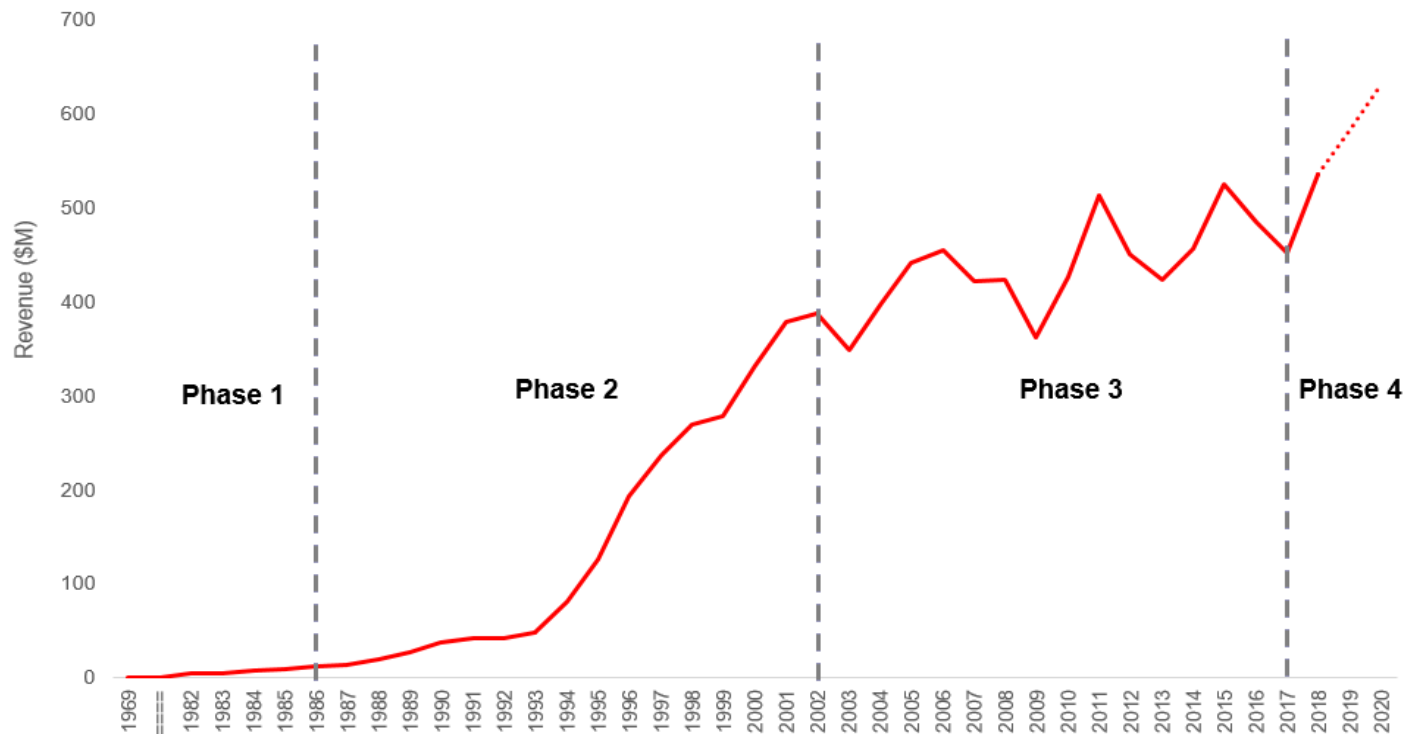
Photronics 50 Years Trusted Global Leader

In 2018, Photronics achieved a record revenue of \$535.3 million.

How have we grown over our 50-year history? Always UP or were there some BUMPS along the way? It surely has not always been smooth sailing!

There has been **ups and downs** along the way. The table below shows how we have grown over the last 50 years. You can broadly think of our growth in four major phases.

Phases of Photronics Revenue Growth





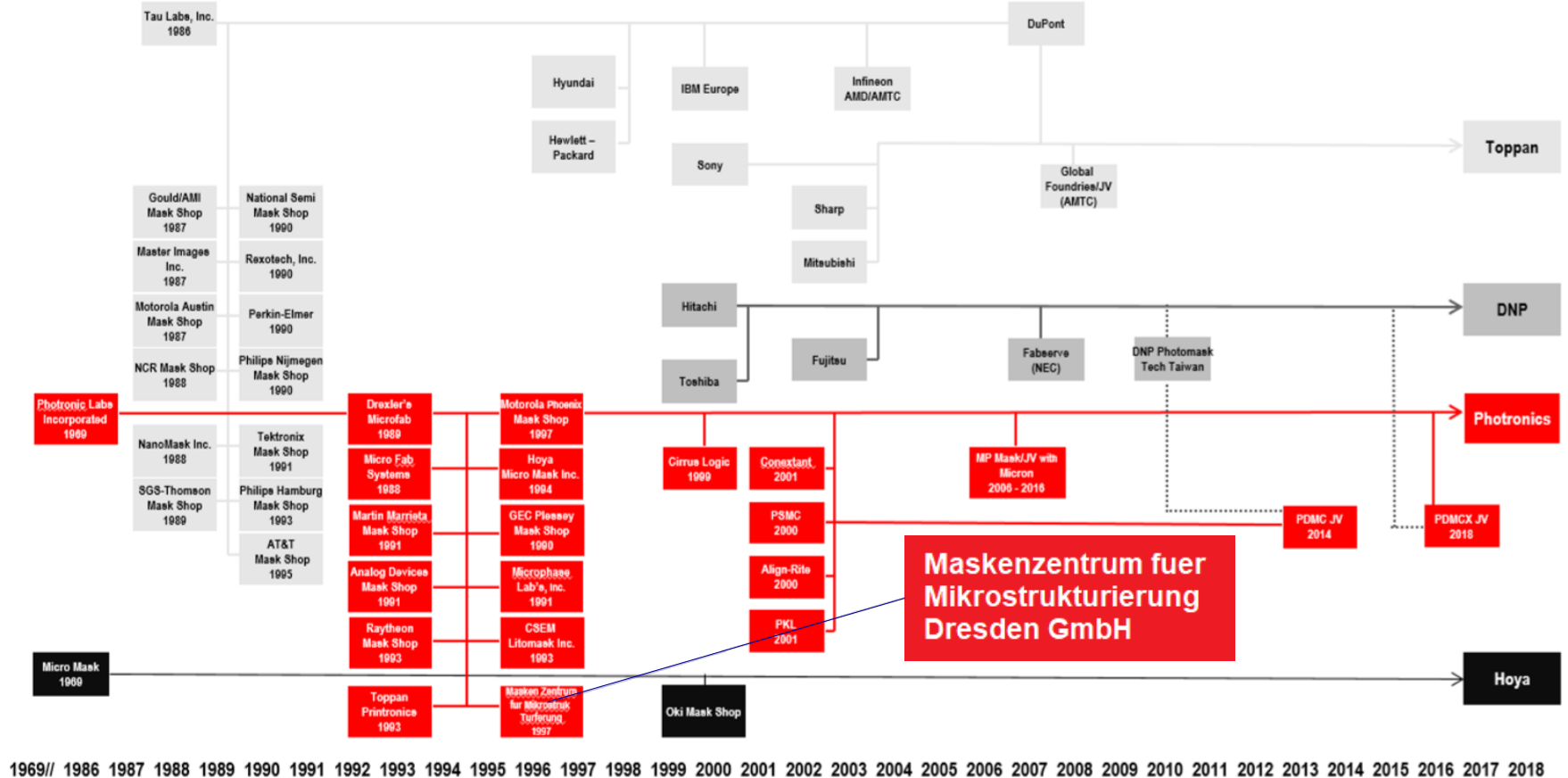
Photronics 50 Years Trusted Global Leader

Phase I (1969–1986): During this phase, we were a **technology start-up**. This was when most of our sales were in the US. **Growth began slowly** and accelerated towards the end of this period. In **1986**, revenues were **\$11.9 million** (the first year our revenue topped \$10 million). We ended 1986 with 170 employees.

Phase II (1986–2002): The second phase was characterized by **rapid growth**. Revenue increased at a compound annual growth rate of 24%. This was **fuelled by acquisitions of mask shops on the different continents** from companies including **Martin Marrieta, Anolog Devices, Raytheon, Motorola, Hoya, Cirrus Logic, and a merger with Align-Rite**. Some funds for these acquisitions resulted from our initial public offering in 1987. These acquisitions lead to a consolidation in the merchant photomask market (see table below) and resulted in our first serious push into global markets. In **1995**, we **topped \$100 million** in revenue for the first time (**\$125.3 million**). In **2002**, revenues were **\$386.9 million**, with **50% in the US**. We had 1,580 employees at the end of 2002.

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Global Consolidation of Photomask Industry 2018



Derived from Semiconductor Equipment and Materials International (SEMI)



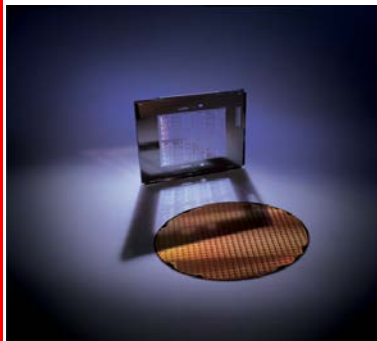
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Phase III (2003–2017): Marked by our strategic entry into high-end markets by investing in advanced technologies and capabilities, and by forming strategic partnerships (e.g., with Micron to form the **MP Mask JV in the US**, and with DNP to form the **PDMC JV in Taiwan**). We also established an **FPD** presence by purchasing **PKL in Korea**. While investing in growth, we also incurred additional **challenges**: the **2008–2009 downturn!**

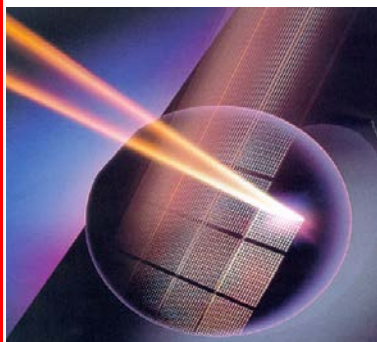
A few notable ‘**firsts**’ during this phase:

- **2003**: revenue outside of the US (59%) was greater than inside
- **2008**: FPD revenue was greater than \$100M
- **2011**: total revenue was \$512.0 million, surpassing \$500M
- **2015**: IC revenue was greater than \$400M (\$420.8 million)

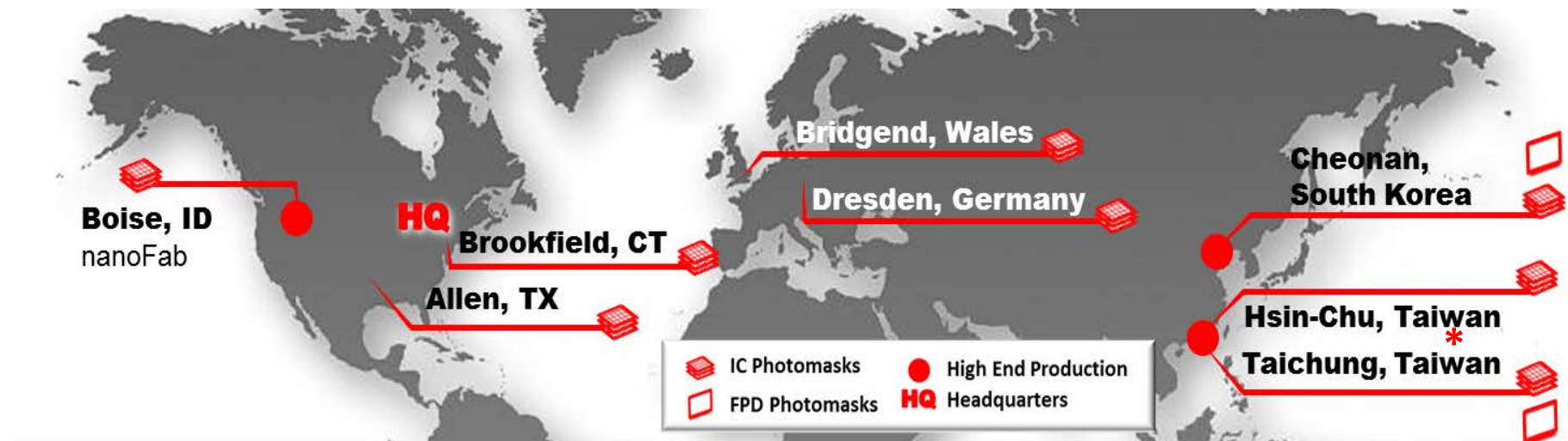
Phase IV (2018 and beyond): Began with record revenue in 2018 of **\$535.3 million**. Several factors are in our favor: We are the **first company** having manufacturing presence for both **IC** and **FPD** ramping two new facilities in **China**. We are also the **first to produce G10.5+ masks**. We have built a **great portfolio of technologies**, providing us with the **capability to produce a wide spectrum of masks**. As we have proved to make good decisions on how globally to **invest in our business, increasing our capacity and extending our capability**, we should continue to grow.



Global Manufacturing presence



Worldwide Manufacturing



- ▶ Strategic manufacturing presence in Asia, Europe and North America
- ▶ High-end anchored lines in US, Taiwan and Korea
- ▶ **World-class manufacturing team** focused on **customer service** and **quality** performance

* Hsin-Chu 2 locations 1A & 1D

EU/US Mainstream Capacity Expansion & Alignment



PHOTRONICS, INC. CONFIDENTIAL

Hefei / FPD – Up to G10.5+, AMOLED:



Construction complete by end of fiscal year 2018.
Tool move in during fiscal Q119.



Xiamen / IC – High-end, Mainstream, Logic, Memory:



**Construction complete by end of fiscal year 2018.
Tool move in during fiscal Q119.**

Aligned with Strong, Global, High-End Customers Serving More Than 700 Customers Worldwide





Photronics 50 Years Trusted Global Leader

As you can see, we have a **dynamic history** that has brought us to our 50th anniversary.

Looking forward, it's easy to imagine a period as dynamic and even more successful. What will the next 50 years hold for Photronics? What will the next 5 years hold? Looking into crystal balls is always tough!

But one thing is certain — Photronics is / we are **loyal** to our customer, and our customers are **loyal** to us, while **together** we have successfully supported **countless projects** for **our end-customers** with plenty of new opportunities and challenges ahead.

Our motto is: Let's collaborate, together, combining and coordinating (Synergizing) our activities to **produce a joint effect**, greater than the sum of their separate. Together we **achieve more** while **growing together!**



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Start, obstacles, Opportunities, Benefits

► Start

- 20 years ago
- Finding the right partner
- SEMICON Russia

► Obstacles

- Shipping
- Organisation structure (maskmaking inside company yes or no?)
- IP protection & NDA
- Communication & Datatransfer

► Opportunities

- Zelenograd Micro Electronics Centre
- Institutes, Waferfabs, Design Centres
- Shared knowledge & Experience => a Mask Centre / to be improved

► Benefits

- Growth / both sides
- ELCOM

Photronics



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Thank you for your business