# Additional Pictures to: Process Induced Defects in Si Chips

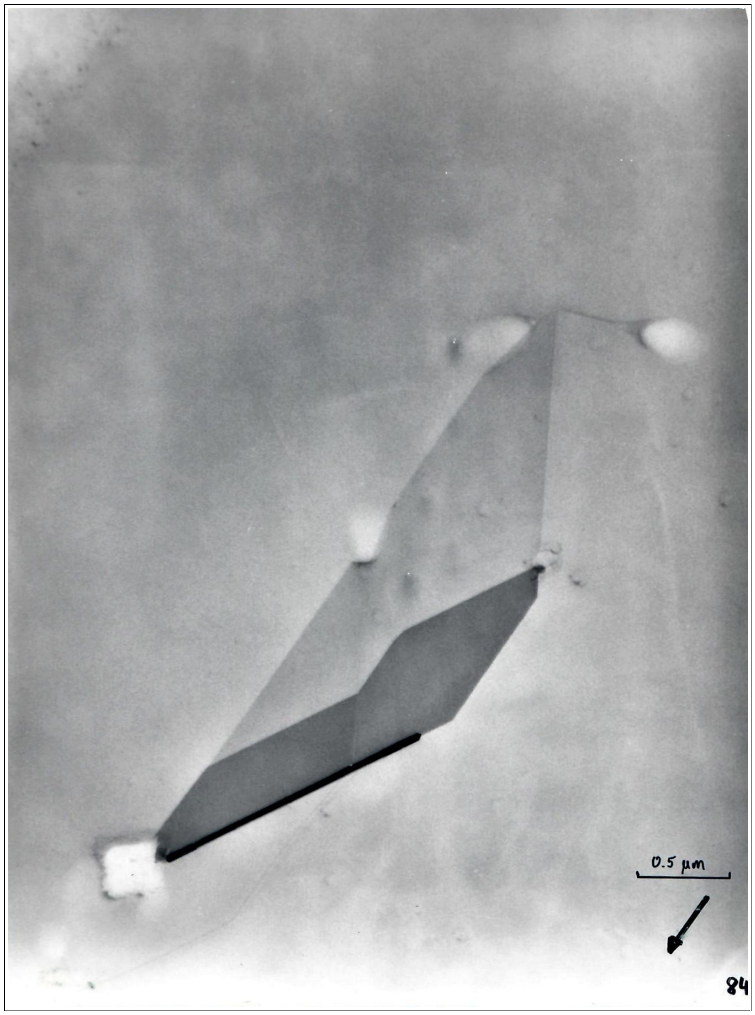
## Part 2  Auxiliary Pictures 2

**Links to**

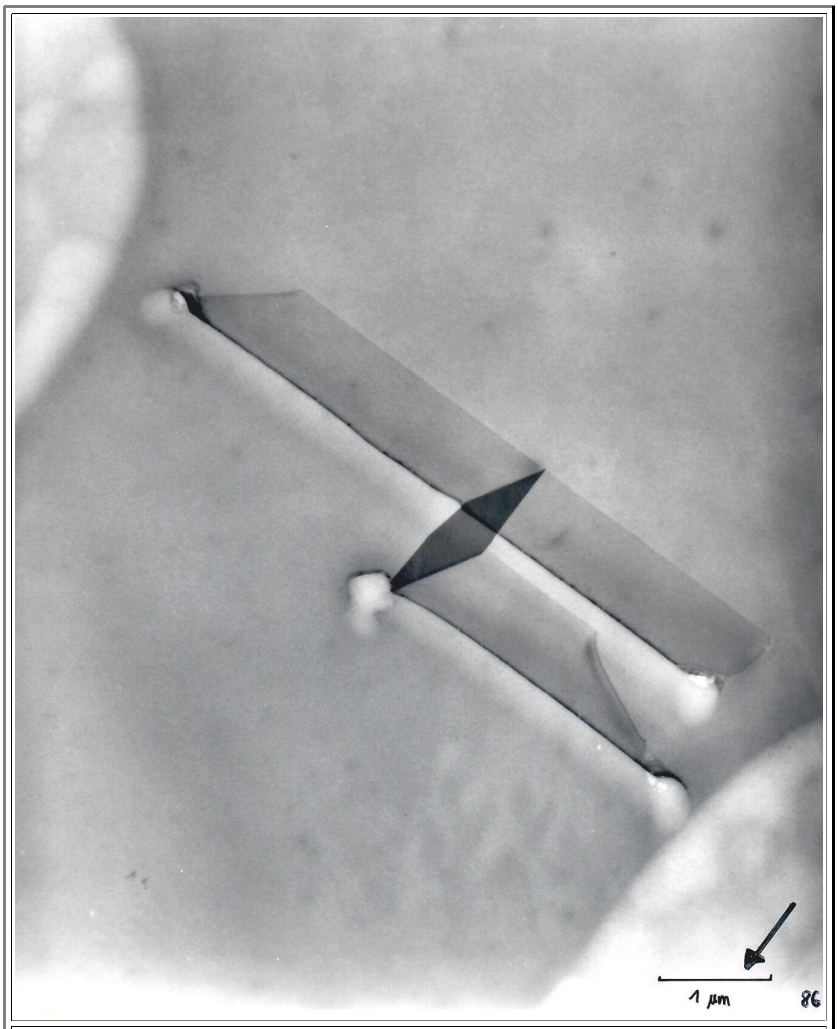
- **Auxiliary Pictures Part 1**
- **Auxiliary Pictures Part 2**

In what follows you find a collection of defects that look like stacking faults on a first glance. However, their contrast behavior is often not quite what one would expect and it turned out that we had complex structures involving micro twins and various dislocations.

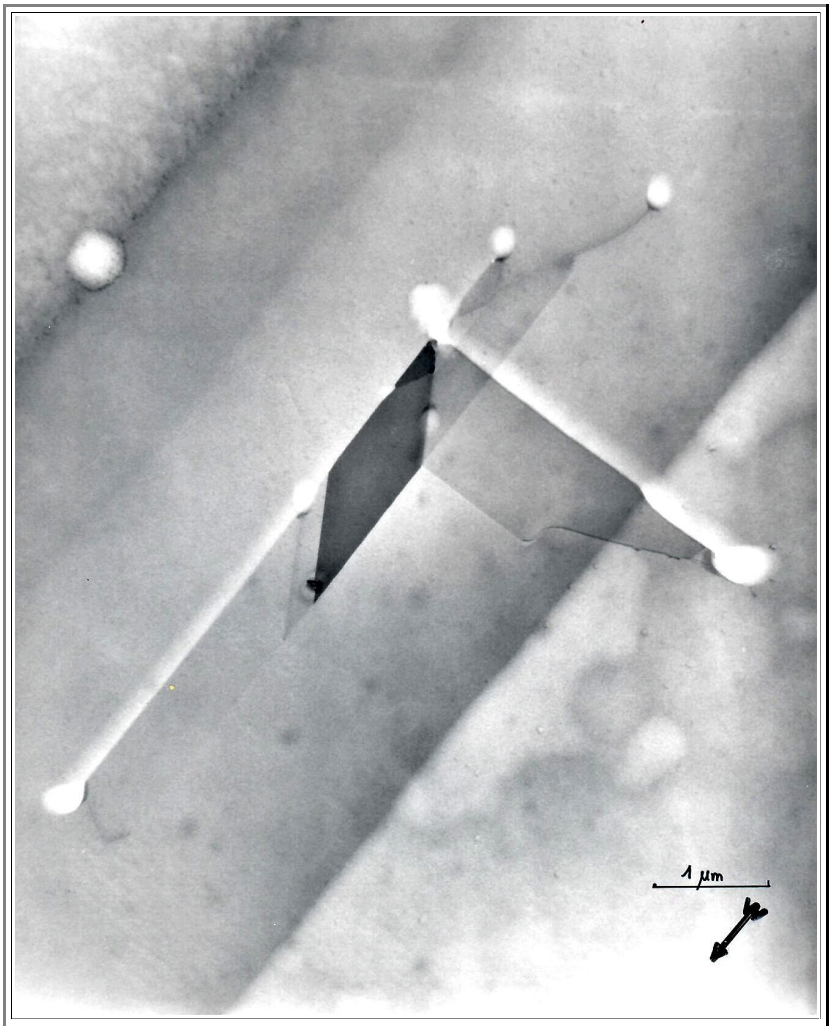
Once more I want to emphasize that we had had the privilege to see these peculiar Si defects for the first time. Nobody, we sincerely believe, had seen anything like that before



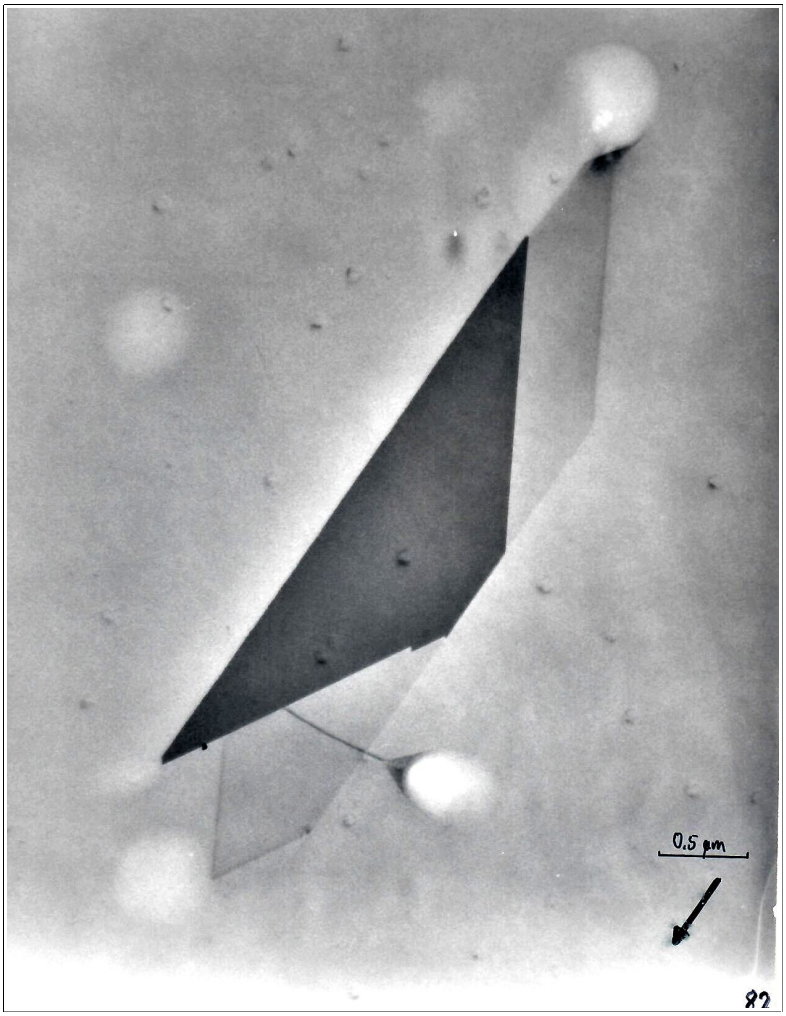

**Auxiliary picture. Similar to Fig. 13 in report.**.
Note that little etch pits denote dislocations ending at the surface.
Note also that one etch pit denotes an "invisible" dislocation while there is no etch pit at
the line denoting strong contrast change. Microtwins are involved here
(and in some of the following pictures)




**Auxiliary picture. Similar to Fig. 13 in report**.
Not etch pits or the lack thereof.



**Auxiliary picture. Similar to Fig. 13 in report**




**Auxiliary picture. Similar to Fig. 13 in report**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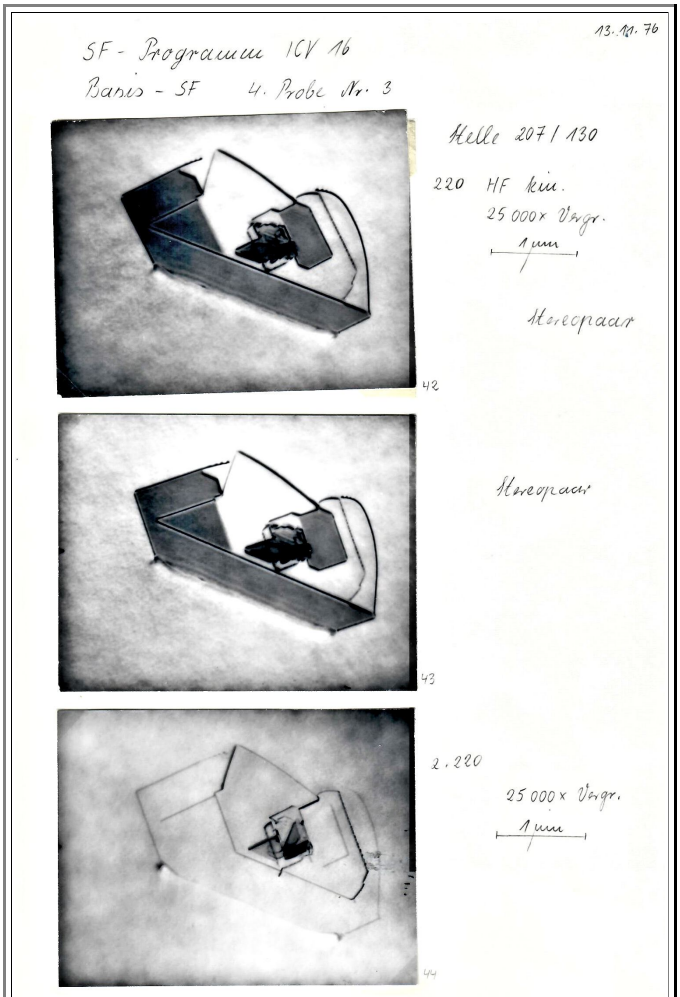


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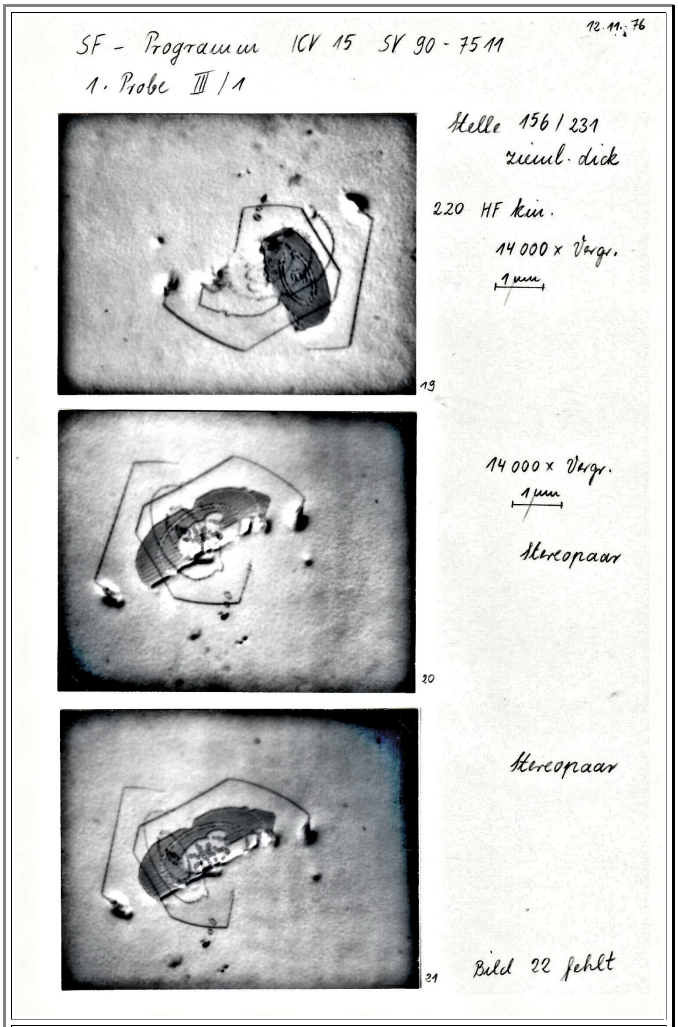
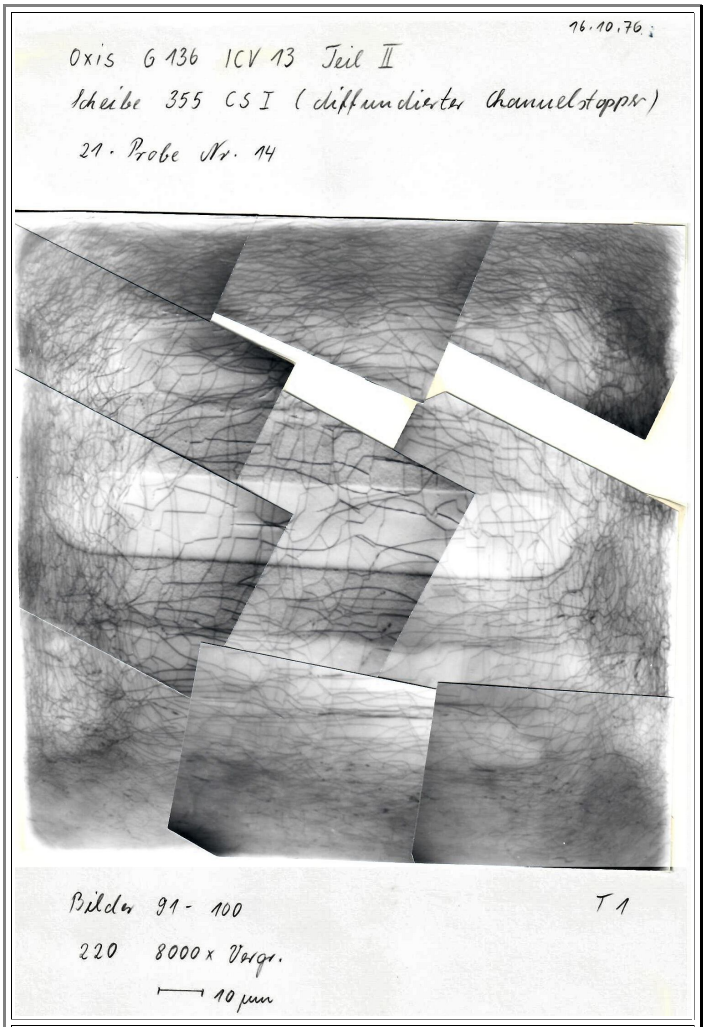
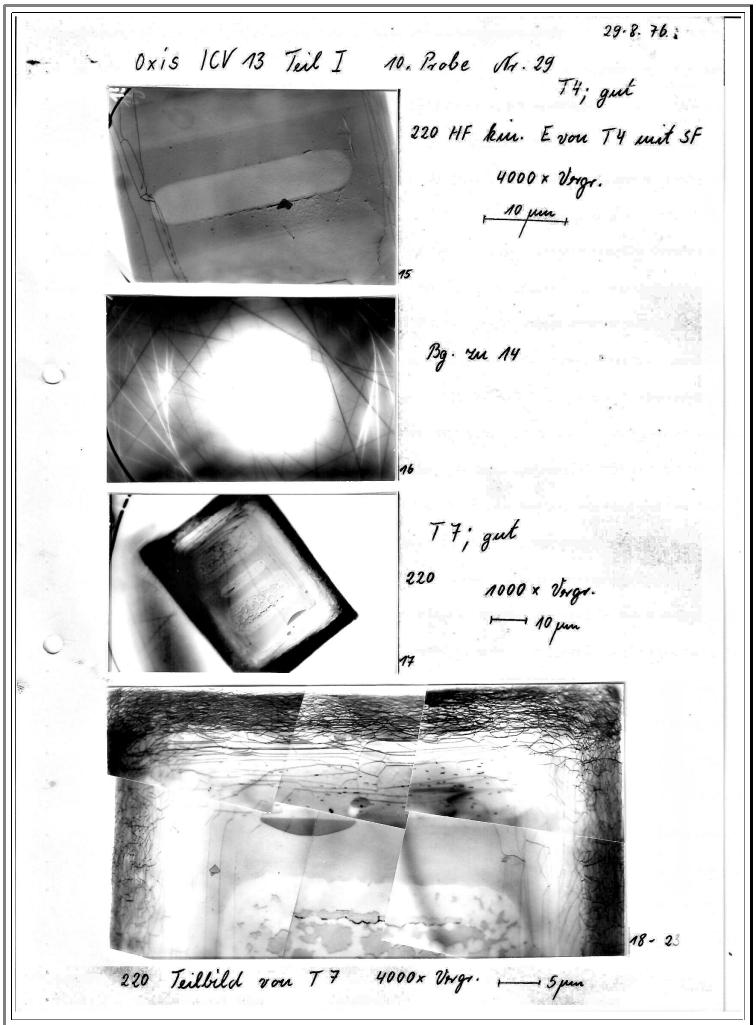
. **Auxiliary picture. Similar to Fig. 13 in report**
Page from our protocols, showing one of the many stereo pairs we took and some contrast analysis by changing diffraction vectors



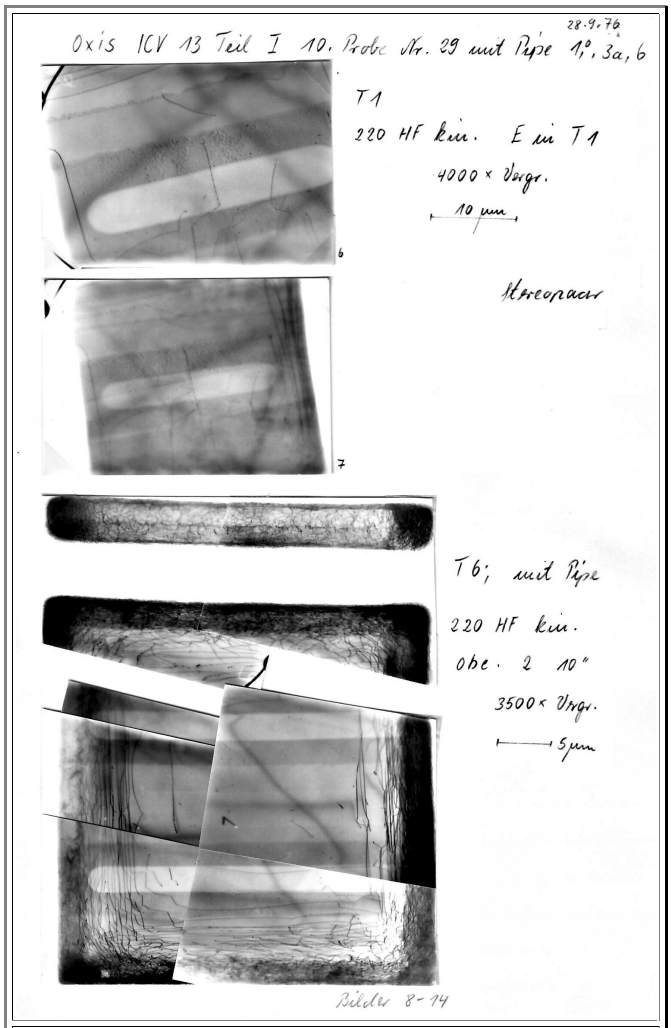

**Auxiliary picture. Similar to Fig. 13 in report**
Page from our protocols, showing one of the many stereo pairs we took and some contrast analysis by changing diffraction vectors.



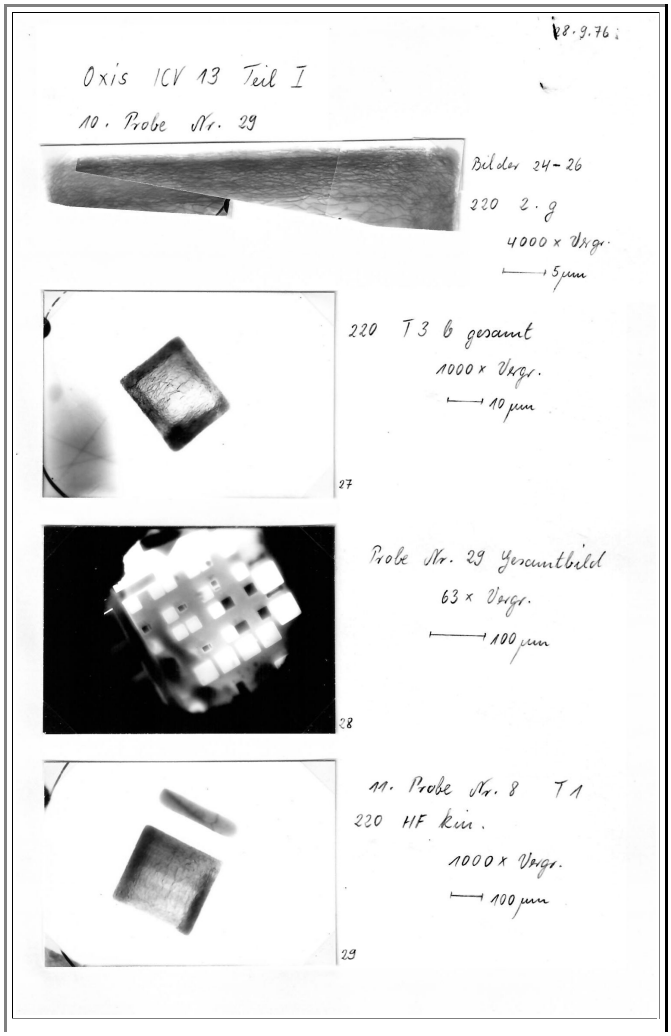

**Auxiliary picture. Similar or Fig. 1 in publications**.
A (huge for today standards) bipolar transistor full of dislocations



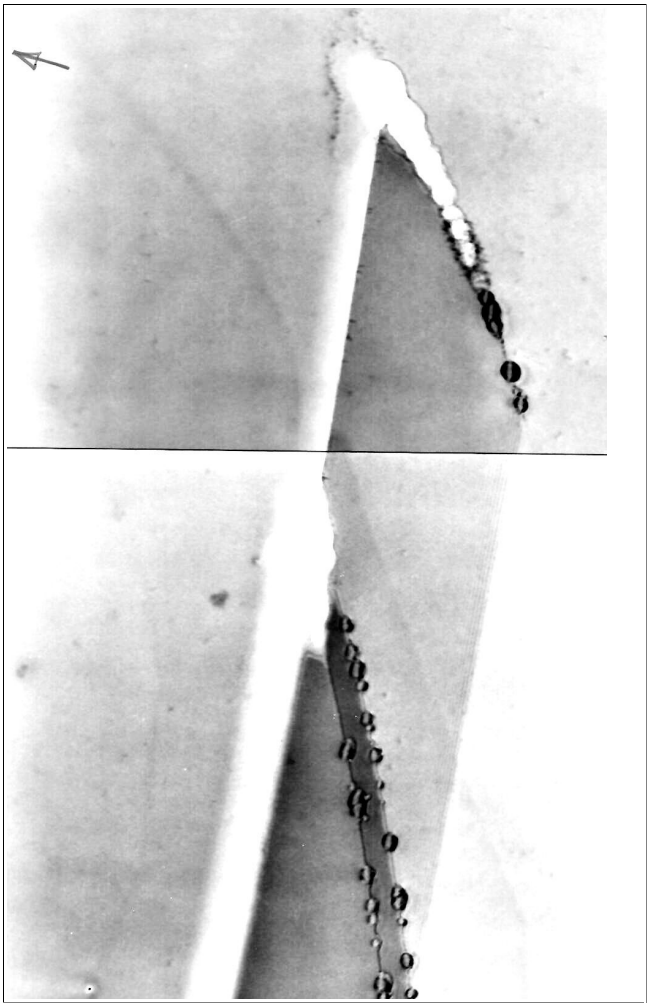

**Auxiliary picture. As above**.
Here you see a diffraction pattern and you also see why it is almost useless to print them.
The contrast is typically far too large to be reproduced on photo paper.
There is also a low-mag picture of the whole transistor.



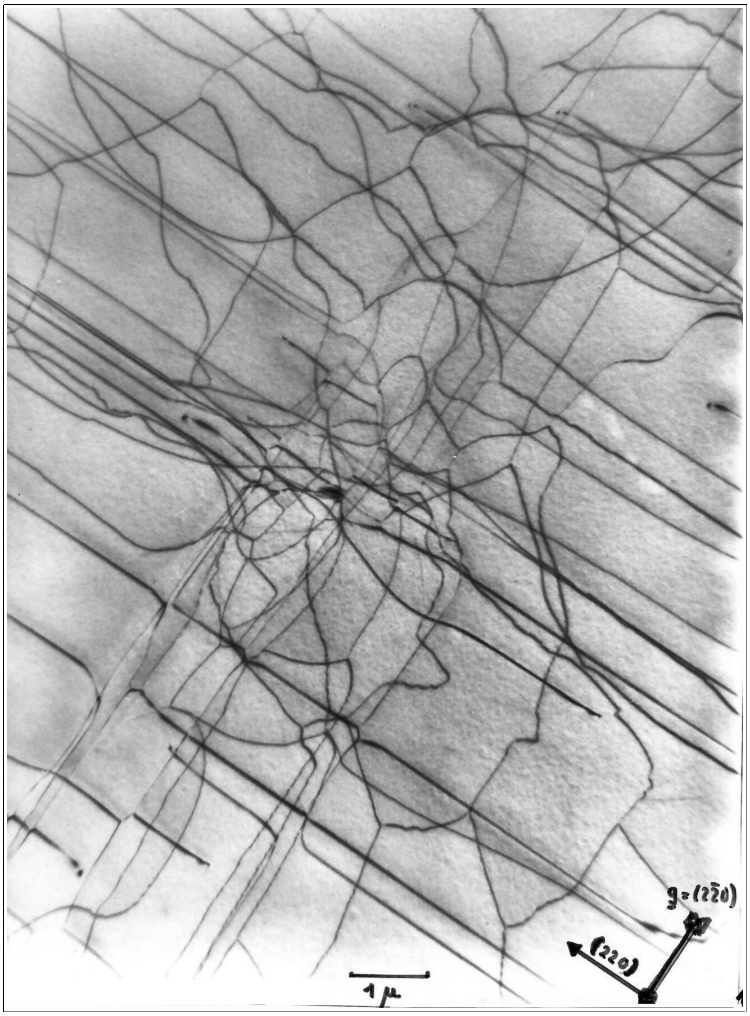

**Auxiliary picture.**
As above.



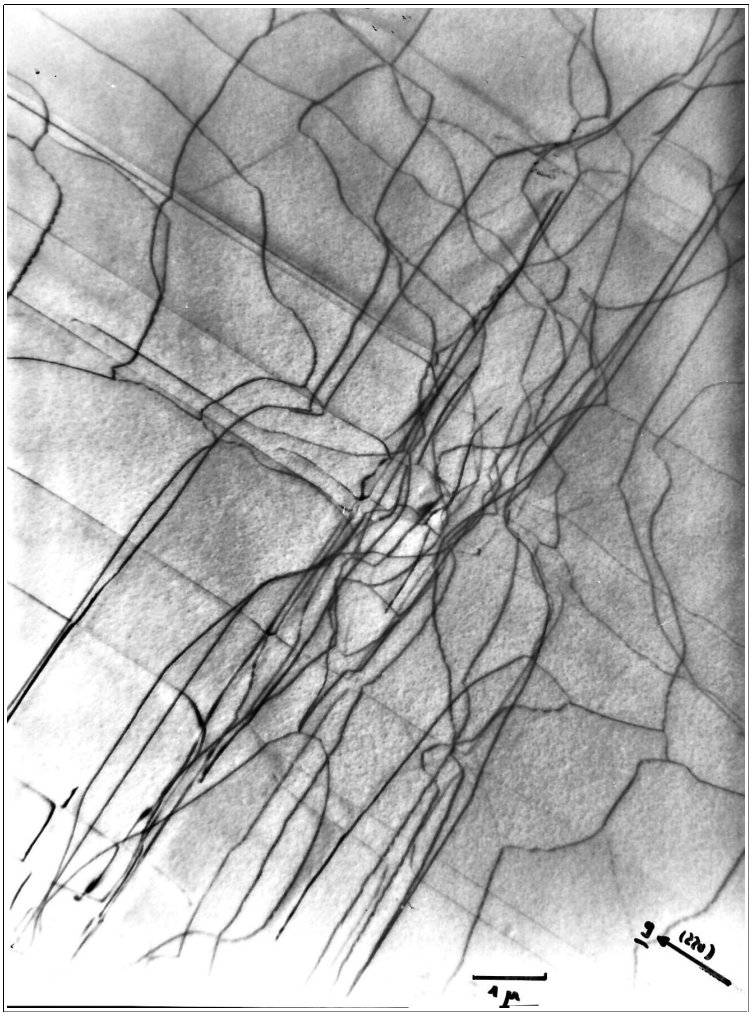
**Auxiliary picture.**
Same as above. We also see an extremely low-mag picture of the whole sample (shown before)
The perfectly white areas consist of Si much thinner than the rest.
Once more, you can't compress the contrast range present on the screen or on the negative to fit on photo paper.



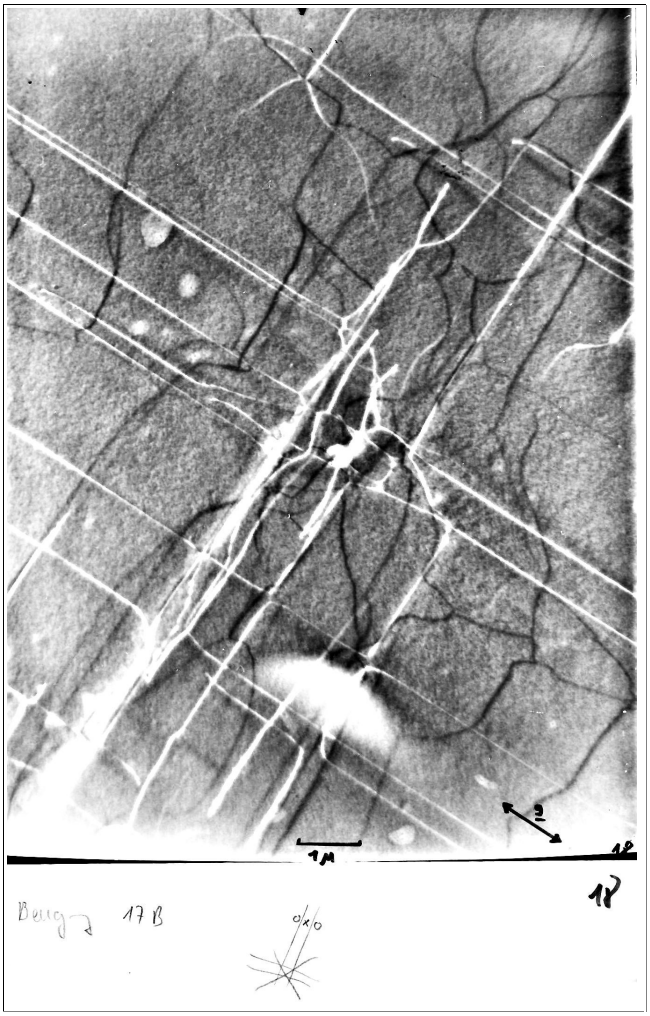
**Auxiliary picture. Goes with most stacking fault parts in the report / publication; especially the "sailing boat" types**
. (Multi) stacking fault. First nucleated (presumably) by a metal precipitate. The the Frank dislocations at its edges acted as nuclei for further metal precipitation



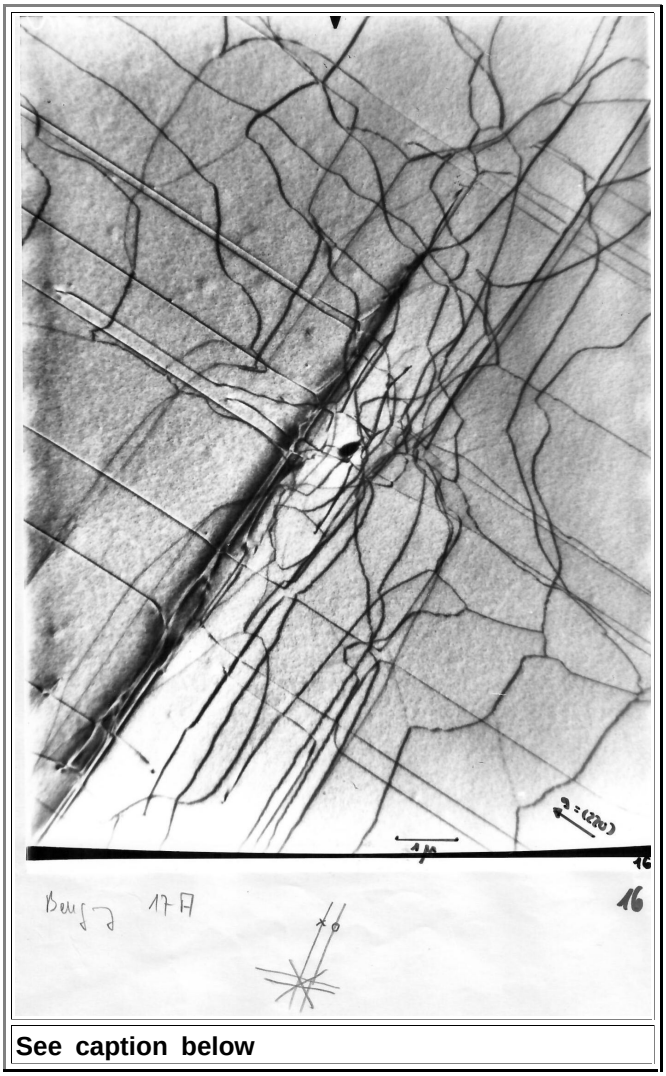

**Auxiliary picture.**
Misfit dislocations produced by stress induced by heavy doping (by diffusion).



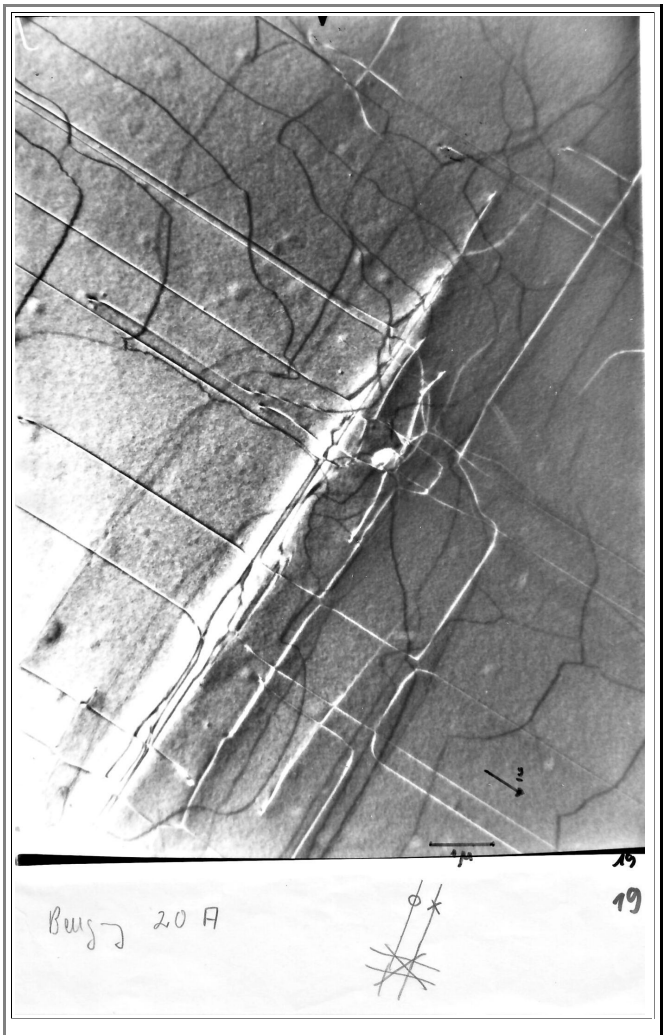

**Auxiliary picture; same as above**
Different diffraction vector as indicated




**Auxiliary picture; same discolorations as above**
We have a weird diffraction effect here, not reported in the literature then.
Imaging in a symmetric three-beam case (as indicated in the drawing) produced
oscillations of the dislocations contrast from black to white, obviously with depth.
Possibly only observable in very thickly samples in a HVTEM




**See caption below**



**+g / -g pictures**
Just changing the sign of the diffraction vector produced weird contrast phenomenae.
Some dislocations showed black-white contrast with a sign change of the black-white vector,
some changed from black to white, some stayed black… This demonstrates that we had all
kinds of problems then that one doesn't have now. It was not always clear what we
encountered (that will happen if you see something for the first time) and contrast
theory wasn't developed to a point where you always understood what your microscope was doing

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