# Pineal gland research with high resolution 3D imaging techniques

Italy-Russia bilateral- project CNR/RFBR (2018- 2020) (Russian number 18-52-7819)

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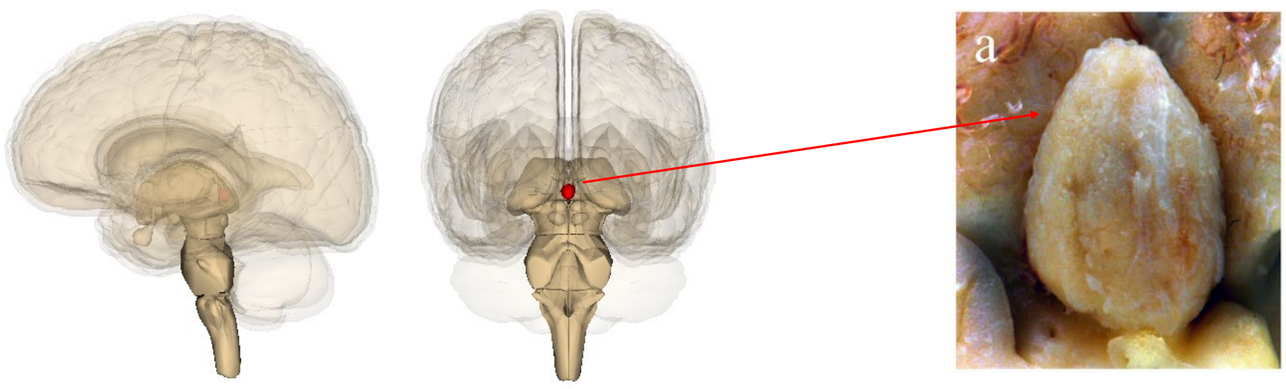
## Propagation-based x-ray phase contrast micro-tomography


X-ray Phase Contrast micro-Tomography enables a high-quality, 3D simultaneous visualization of human pineal gland at scales spanning from a few millimetres to hundreds of nanometres, without the need of contrast agents, and without destructive sample preparations and sample sectioning.

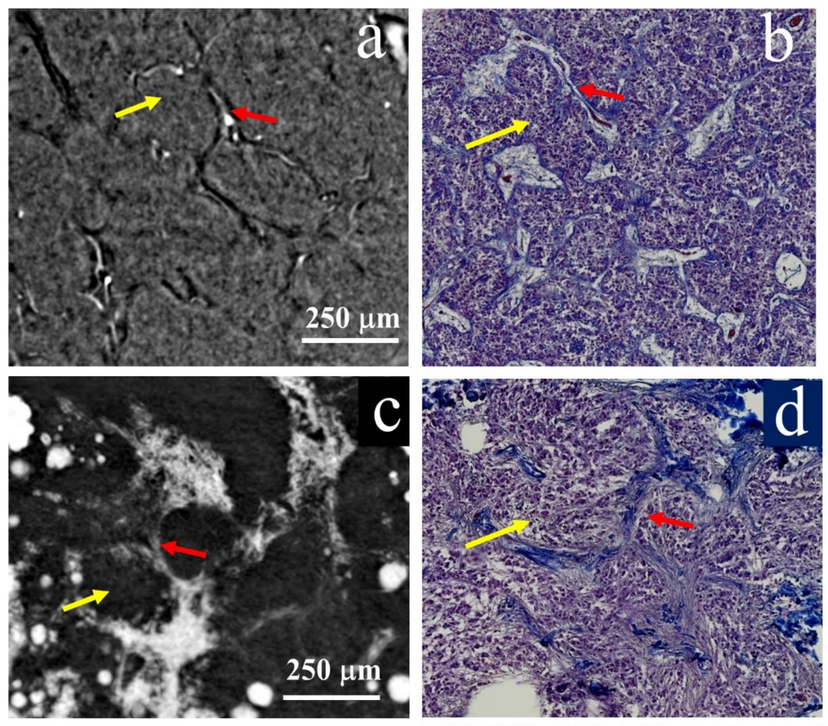
The pineal gland (PG), composed mainly by pinealocytes (neurosecretory cells that secrete serotonin and melatonin), is a central structure in the circadian system, which produces melatonin under the control of the central clock, the suprachiasmatic nucleus. Calcareous deposits, which are known as pineal calcifications, are a normal physiologic phenomenon in PG. Calcium content and pineal concretions have been studied for a long time because of their association with aging and neurodegenerative diseases. Researchers suggest that the PG's calcified deposits are associated with decreased number of functioning pinealocytes and reduced melatonin productions. In this framework, we characterized the calcifications structure of the human brain pineal glands and we studied the vascularization and the connectivity tissue structure of the pineal gland as a function of the concrementes density. In particular, in the framework of the Russia-Italy bilateral- project CNR/RFBR (2018- 2020) we have investigated the structure of soft tissue in human pineal glands at different ages with high resolution X ray phase contrast tomography and high resolution 2D techniques This study will allow to shed light on the role of the human epiphysis in the development of neural degenerative disorders, and to develop criteria for early diagnosis of these diseases.

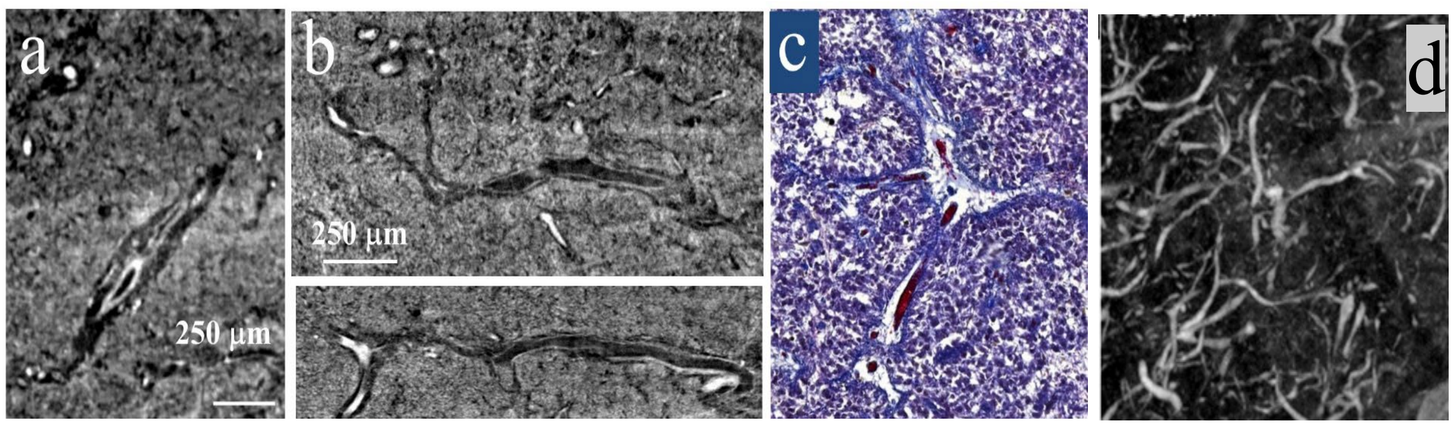
## SAMPLE : human pineal gland



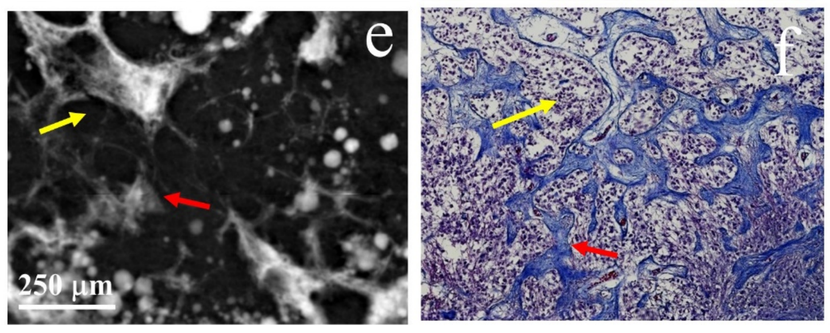

https://it.wikipedia.org/wiki/Ghiandola_pineale

a) XPCT image of the PG;




(a,b) XPCT slice of PG with blood vessel; (c) histological section; (d) XPCT 3D image of PG blood vessels




The parenchyma of a mammalian pineal body is divided into lobes (yellow arrows) by fibrovascular stroma (red arrows), (a,c,e) XPCT image; (b,d,f) histological sections.

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