Recent advances in molecular biology, biochemistry and genetics have broadened our understanding of tumourigenesis and of the maintenance and spread of pancreatic cancer far beyond traditional microscopic histopathological analysis. While the main focus of pancreatic cancer research has been on pancreatic ductal adenocarcinoma, molecular research has also led to a better understanding of rare tumours of the pancreas, as well as to the definition of previously unknown tumour entities that can only be identified through the application of molecular tools. Furthermore, molecular analysis increasingly reveals the genetic and cell biological heterogeneity of established tumour entities, making subclassification of tumours possible. Genetic and molecular approaches may, therefore, not only lead to a better understanding of the pathogenesis of pancreatic tumours, but also culminate in more precise diagnosis as well as individually tailored treatment strategies for affected patients.