Capability Immaturity Model levels in Science

or: real research happens in the lab

(lightly adapted from https://en.wikipedia.org/wiki/Capability_Immaturity_Model)

0 : Incompetent

The researcher loudly values implementing correct processes, lab practices and training: but lacks the will to carry through the necessary effort. Whereas CMM level 1 assumes eventual success in producing research, CIMM level 0 researchers generally fail to produce any valuable research, or do so by abandoning regular progress for recurring periods of "drop it all" emergency style work.

-1 : Obstructive

Processes, however inappropriate and ineffective, are implemented with increasing rigor and tend to obstruct actual research ("make one experiment perfect", "ran control assay 10 times in a row"). Adherence to the process is given as the measure of success by a Level -1 researcher. Any actual creation of valuable research is incidental. The quality of research is not assessed, presumably on the assumption that such assessment is unnecessary since if the proper process is followed, high quality is guaranteed. This is the most common level achieved by researchers that lack either self-management or drive.

Level -1 researchers believe fervently in following defined procedures, but lacking the will to assess the effectiveness of the procedures they implement, they rarely succeed at their basic task of creating research. Undergraduate evaluations (or industry trainings) insist on e.g. "good housekeeping practices" as a prerequisite to be allowed to perform useful research; some researchers do not move beyond this stage to self-evaluate by the actual value of their output, rather than the number of hours spent on processes.

-2 : Contemptuous

The researcher's ineffectiveness has become apparent to their lab colleagues or supervisor; they ignore or attempt to neutralize these unfavorable perceptions. Excuses are found, and the researcher's locus of control shifts away from themselves. Measures of activity (number of assays started, hours worked; training courses done; or "organising for others" e.g. lab reorganisation / inventory) replaces measures of actual productivity (number of new assays and results completed, implementation of new skills into ongoing research, progress towards overall project and personal goals, paper and chapter drafting). Volatility in own current aims and work schedules that is made necessary by poor planning or goal avoidance is recast as "adaptiveness" and drive. Certifications on new training courses, applications, possibilities are presented as evidence of motivation and desire to succeed; while low research output and poor quality results are blamed on factors outside the researcher's control. The researcher starts to omit or shortcut essential components of well-organised research (e.g. high-quality lab book, open electronic data sharing, regular research progress updates). The researcher falls behind schedule, leading to a feedback cycle of increasing disorganization.

-3 : Undermining

Undermining researchers downplay and sabotage the efforts of other group members, especially those successfully implementing processes common to CMM level 2 and higher. This behavior may involve competing for resources (instrument time, bench space, reagent money; demanding colleagues spend increasing amounts of their time to support what should have been the researcher's own work, often accompanied by withdrawing from activities in support of others such as shared projects, joint lab tasks and group jobs; insisting on increasing time from supervisors to be able to meet expectations, or multiplying time investments to re-clarify decisions in writing that have already been discussed; last-minute re-scheduling of meetings with others) which draws those resources away from more effective researchers and from supervisors, so negatively impacting the group as a whole.