excerpted and paraphrased from Kuhn's Structure of Scientific Revolutions (1962) by Jahn

“When an anomaly comes to seem more than just another puzzle of normal science, the transition to crisis and to extraordinary science has begun. The anomaly itself (e.g., that a sharp focus on increasing yield and efficiency in ag systems doesn't get us what we thought it would bring us in food systems) now comes to be recognized as such by the profession.

More and more attention is devoted to it by more and more of the field's most eminent men. If it (the anomaly) still continues to persist *as it usually does not*, many of them may come to view its resolution as the subject matter of their discipline (e.g., the present focus on "food security" and "sustainable Intensification"). For them the field will no longer look quite the same as it had earlier. Part of its different appearance results simply from the new fixation point of scientific scrutiny.

An even more important source of change is the divergent nature of the numerous partial solutions that concerted attention to the problem has made available. The early attacks upon the resistant problem will have followed the paradigm rules quite closely. But with continuing resistance, more and more of the attacks upon it will have involved some minor or not so minor articulation of the paradigm, no two of them quite alike, each partially successful, but none sufficiently so to be accepted as the paradigm by the group.

Through this proliferation of divergent articulations, the rules of normal science become increasingly blurred. Though there still is a paradigm, few practitioners prove to be entirely agreed about what it is. Even formerly standard solutions of solved problems (e.g., abundance) are called in question.

When acute, this situation is *sometimes* recognized by the scientists involved…..
p. 83 The Response to Crisis

A quote in Kuhn attributed to Copernicus "With them (the astronomers of his day) it is as though an artist were to gather the hands, feet, head and other members for his images from diverse models, each part excellently drawn, but not related to a single body, and since they in no way match each other the result would be a monster rather than a man."

Back to Kuhn. "Such explicit recognitions of breakdown are extremely rare but the effects of the crisis do not entirely depend upon its conscious recognition."

The transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of the old paradigm. Rather it is a reconstruction of the field from new fundamentals, a reconstruction that changes some of the field's most elementary theoretical generalizations as well as many of its paradigm methods and

applications. During the transition period, there will be a large but never complete overlap between the problems that can be solved by the old and by the new paradigm. But there will also be a decisive difference in the modes of solution. When the transition is complete, the profession will have changed its view of the field, its methods and its goals. One perceptive historian viewing a classic case of a science's reorientation by paradigm change recently described it as "picking up the other end of the stick" a process that involves "handling the same bundle of data as before, but placing them in a new system of relations with one another by giving them a different framework." Others who have noted this aspect of scientific advance have emphasized its similarity to a change in visual gestalt.

p. 90. Almost always the men who achieve these fundamental inventions of a new paradigm have been either very young or very new to the field whose paradigm they change…. obviously these are the men who, being little committed by prior practice to the traditional rules of normal science are particularly likely to see that those rules no longer define a playable game and to conceive another set that can replace them.

p. 90-91 Confronted with anomaly or with crisis, scientists take a different attitude toward existing paradigms and the nature of their research changes accordingly. The proliferation of competing articulations, the willingness to try anything, the expression of explicit discontent, the resources devoted to philosophy and to debate over fundamentals, all these are symptoms of a transition from normal to extraordinary research.

Paradigms are not corrigible by normal science at all p. 122

There can be no scientifically or empirically neutral system of language or concepts p. 146

The transfer of allegiance from one paradigm to another is a conversion experience, it cannot be forced. p. 151

Kuhn talks alot about how important the "insulation" of scientific communities (their expert nature, the long training from textbooks, etc.) is in protecting failing paradigms. p. 164