

## Intro

1. Eq.(1.1.9): spend a few words on the classical LD-picture and the quantization (maybe by ref. to BM)
2. Fig.1.1.1: explain the dashed lines, shown in the inset; explain the double-parabola
3. Fig.1.1.3 & 1.1.4: poor quality
4. p.20: unclear sentences:
  - "This behaviour is to be found..." that sentence mixes up a variety of phenomena which better should be discussed in separate sentences
  - "...which change in one unit..." the same is true for this sentence.

Such highly condensed statements appear repeatedly also at other instances of the text. For those readers using the book as an introductory text to and/or a study text for nuclear theory, this might pose severe problems.
5. Eq.(1.2.3) etc. : explain  $\kappa$ , explain  $\hat{\alpha}$
6. Eq.(1.2.6): point out that the proper in-medium interaction has to be used to. e.g.  $v=v(\vec{x},\rho)$
7. Fig. 1.2.1: poor quality
8. Footnote: RPA sums the bubble or ring diagrams (Fig. 1.2.3), ladder diagrams are contributing to fig.1.2.2
9. Fig. 1.2.2: left column is of poor quality; what is the rationale to show (3) and (4) in addition to (1b) and (2)?;  
(8) might be attached to (5) and (6); the phrase "bare NN-interaction" is misleading: I guess, it's the ladder-summed (Breuckner)  
in-medium interaction what is meant
10. Caption Fig.(1.2.3): The equations ( $Y$ ,  $1/\kappa$ ) deserve a deeper discussion in the text
11. Fig.1.3.1: the appearance of bold "=" and "+" and  $\Sigma$  distracts the reader from the true content, namely the diagrams.
12. Eq.(1.3.4): a coupling constant might be in place.
13. Fig.(1.3.2): very busy figure, many new and unexplained symbols and notations, e.g. what is  $\sigma$ , what is meant by the various "Q"s?  
Someone who is not yet an expert, might get lost. As a rule: Help the potential reader, otherwise people may give up reading the book!
14. p. 30: The phrase "...is thus gauge invariant." might be controversial in its generality and therefore should be explained in view of that  
QFT/QED-people have a different understanding of gauge invariance, so do our friends from chiral EFT etc.
15. Eq.(1.8.4): although the notation  $a^\dagger(\vec{r})$  is used frequently, I'd prefer the QFT notation  $\psi(\vec{r})$  as used in many other  
text books of quantum many-body theory - but that might be a matter of personal taste
16. p.50, First paragraph: it might be mentioned that  $m_\omega$  is

related to the (energy-)slope of the dispersive self-energy

17. Eq.(1.8.7) and (1.8.8): definition of  $R_{\{v_i\}}(r)$ ?

18. A conclusion on Chpt.1: many interesting and important topics are addressed but the rather condensed presentation might

bring the non-expert reader to a feeling of "getting lost". Many of the NFT aspects, you are discussing later

anyway in due detail, so there is no urgent need to "squeeze" them into the introduction. As I wrote before, it might be more helpful

to the reader to spending instead more space on the origin and structure of NN-interactions in the nuclear medium and how they lead to

self-binding and other cooperative dynamical effects in nuclei.

## Chpt. 2

1. p.67: the last paragraph, "An essential test..." is hardly understandable,  
esp. the second sentence seems to be a fragment, the same for  
"Coupligns which are.."
2. As a general remark: in many cases the figure captions are quite extensive, containing  
important material which would better be discussed in the running text.
3. Fig.(2.4.1): much too busy!! No one will understand the meaning of all the lines, coming without labelling.  
Is that fig. really needed?
4. Fig.(2.4.2): the lines are a bit faint.
5. Sect. 2.7.4: Many of the figures are of bad quality - maybe it's a problem of the proof printing?
6. Sect.2.9.2 is in danger to "trivialize" the optical potential problem. I'd suggest to refer to the vast literature on that subject,  
e.g. the books of Satchler, Feshbach, Hodgson and the reviews of Mahaux et al.
7. p. 134: You should reconsider that busy figure: It is worth at least 5 separate figures and the equations must be  
discussed in the running text. That figure might work in a talk where you lead by discussion the audience through the  
displayed material. But it's horrible in printed form, probably mainly due to the reduction from screen to page format.
8. p.135/136: the numbering looks a bit odd - spend a period to the numbers, i.e. use 1. 2. 3.
9. Fig(2.9.2) -> see remarks 2. and 7.
10. Fig,(2.9.3), upper part -> see remarks 2. and 7.
11. Fig.(2.9.4) -> see remark 2.
12. Fig.(2.9.5) -> see remark 2.
13. Fig.(2.10.1) another very busy figure which would deserve disassembling into a couple of separate figures.  
I understand the intention to illustrate the interplay of various observables but is that also obvious to a  
broader readership?
14. Conclusions on Chpt.2: Overall, it's well done, also the material in the appendices! The connection of microscopic aspects of nuclear many-body dynamics and nuclear phenomenology is elucidated  
by NFT. Why don't you start the chapter with introducing NFT in the first place? I'd consider such a rearrangement an  
interesting alternative, putting more weight on "hard" many-body theory.

### Chpt. 3:

Overall, I like this chapter very much!

- Fig. 3.2.15 exceeds the layout of the text width
- Fig. 3.3.1 check the text-inlay and caption: q meany Q? Mis-adjustment of "a~"
- a general remark: mean field (your use) or mean-field (widely used in the literature)?
- Fig. 3.4.1.: bad quality - at least in the proof copy
- why do you change to small initial letters in subsections

3.4.1/3.4.2

- Fig. 3.4.2.: another example for a figure which works well as a transparency but may put the reader in despair when printed
- Fig. 3.5.2/ 3.5.3 and 3.5.4/3.5.5: why are you using different layouts (small vs. bold lines) for the two diagrams? It might be even better to combine the two graphs into one figure
- title of sect. 3.6: "Halo pair addition mode and pygmy:..." the left alone "pygmy" reads like a fragment of a sentence waiting for completion
- "clothed" is a bit unusual compared, main use is "dressed"
- Fig. 3.A.1 comes around a bit overcrowded and exceeds the text layout
- check type-setting of " $\wedge 9LI(t,p)...$ " on p. 229
- the hand-drawn diagrams in the App. 3.D are artful but fall out of the scheme of the book

## Chpt.4:

That's a highly valuable connection to nuclear reactions and solid state physics and many worked out mathematical/theoretical relations!

- check Fig. 4.1.1 and 4.1.2: the formulas deserve a better presentation. Why not including them into the text together with the extended explanation in the captions?
- Fig. 4.1.3: a noisy figure, also because the sub-labels a), b) etc. appear to be distributed randomly
- Fig. 4.2.2: a bit faint. (A much more impressive presentation is to use LaTeX and display  $r^2 \rho$ )
- p. 273, center: why " $2\xi \approx 30 \text{ fm}$ " at this location?
- p. 277/4. line: PDR = Pygmy Dipole Resonance
- nice "Sokratesian" presentation of the pros and cons in sect. 4.4

- sect. 4.5: see my previous remarks on the danger of "trivializing the OMP". The dispersion relation technique is powerful in principle but requires the knowledge of the full energy (and momentum) dependence of either the real or the imaginary part in order to be a tool

beyond a plane recipe

- Fig. 4.8.1: much too busy and hampered by combining various styles! Split and clean it up.
- Fig. 4.B.3: oversized
- p. 335: misaligned formula in 1. paragraph of sect. 4.B.3
- p. 346: Start the headline with a capital letter

## Chpt 5

This chapter, together with chpt. 6, are covering an impressive amount of material! It will be of high value for everybody who is working actively on the theory of transfer reactions and the practical-numerical applications thereof. Especially the very detailed discussions in the appendices will be a big help for advanced students and experienced researchers. I like very much that you consider the wave functions of the transferred particles as entities, refraining from introducing the artificial concept of spectroscopic factors as independent quantities.

Maybe I missed it: Reference to the book of Feshbach (Vol.2 Reaction Theory) might be added. Historically, Tamura did a lot of fundamental work on the theory transfer reactions, esp. addressing and solving the non-orthogonality and non-locality problems of single and multiple particle transfer with complex projectiles. There are (at least) two Phys.Rept.'s from the 1970ies by Tamura on these issues, as you might remember from your collaboration with him.

- p.362; misaligned formula
- Fig. 5.2.2: missing labels on all axes
- Fig. 5.H.1; misaligned, exceeds the page layout. Also, that figure is positioned in the references.

## Chpt. 6:

The general (enthusiastic) remarks in remarks on Chpt. 5 apply also to this chapter. The workout of 2nd order DWBA is highly appreciable. Both chapters together qualify in fact for a separate monograph!

- Eqs. 6.1.2 & 6.1.3.: Why do you introduce the  $A+2$  particle wave function as a Wood-Saxon eigenfunction already so early?

At this point, wouldn't it be enough to say that it is defined as an overlap wave function and is such a matter of nuclear structure theory?

If desired, one may certainly add that in practical calculations a widely used approach is to use W-S eigenfunctions. In general (later parts of that chapter), I'd refer to the W-S wave functions as part of the "practitioner's tool box".

- p. 427, 1st paragraph: check the definition/decomposition of the triton wave function. The use of the same symbol ( $\rho$ ) for quite different objects is a bit misleading.

- in App. 6.D, App. 6.E; and App. 6.F: titles are printed by small letters, different from the use before and after,

- App. 6.H: the title is misaligned

## Chpt. 7:

i like very much the applications to the halo systems. That aspect is worth to be put into the foreground in the introductory paragraph instead of the "software" issue (see below). On the other hand, a brief introduction of the standard codes for numerical simulations of nuclear structure and reaction problems and where to find them would be of great help for the reader.

- To me, the title looks like a fragment. Wouldn't it be better to choose a title "Structure Studies with Transfer Reactions" or "Transfer Reactions as Nuclear Structure Probes" or "Probing Nuclear Structure by Transfer Reactions"?

- The message of the very first sentence is unclear: What do you "with the help of software"? To me, one way of understanding is that you're

going to introduce computer codes (and make them available to the reader). However, a look into sect. 7.C shows that you are "only" giving a

conceptual description of a numerical scheme. Also, what means "see App. 7.C cooper, one"?

- Anyway, I'd use "computer codes", rather than the unspecific word "software".

- p.491, first line in sect. 7.1, misaligned

- Fig. 7.1.2 is washed out, needs "sharpening"

- Fig. 7.1.3 exceeds the page layout. If reduced the text (configurations) in the two lower boxes might be hardly readable

- Tabs. 7.1.1 and 7.4.2 are misaligned

- The titles of sects. 7.1.1 and 7.1.2 are looking a bit lost: "Structure" of what? "Reaction" for what?

- p. 496, 2nd line, misaligned

- p. 496: "little convergent" means probably "weakly convergent"?

- Fig. 7.3.1: too busy, too small characters of the boxed-in text

- p. 512: the title of sect. 7.5.1 deserves some explanation in the text. As it stands, reader will not understand the various mysterious notations and how they are connected. Also mysteriously, that notation reappears as title in sect 7.6.

- first sentence of sect. 7.5.1: "phase space" might be misleading, "configuration space" seems to be more appropriate. Many readers probably connect "phase space" with the kinematical on-shell phase space of a reaction. The P- and Q-space concept and the related dressing

by induced interactions could be a better approach.

- p. 513: as I wrote before, "clothing" -> "dressing" might be the better choice, connecting more easily to the literature

- Eq.(7.6.1): indicate the coordinates also on the RHS of the



equation

- App. 7.G: I like those "cross-disciplinary" discussions but I'm afraid that the un-introduced reader will be in despair "What to the hell that has to

do with the rest of the book". A better motivation would help, indicating the generality of the phenomena.